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ABSTRACT

A 1994 report, "Quality Profile for SASS, Aspects of the Quality of Data in the Schools and Staffing Surveys (SASS)," presented and summarized the available information about the quality of the data from the five surveys that made up the SASS in its first two rounds of data collection (1987-1988 and 1990-1991). This report updates the information from that report and incorporates information about the quality of data from the surveys of the third round of the SASS. Following an introduction, the report contains a section evaluating data quality and providing background information for each of the surveys: (1) the School Survey; (2) the School Principal Survey; (3) the Teacher Demand and Shortage Survey; (4) the Teacher Survey; (5) the Teacher Follow-Up Survey; (6) the Library Survey; and (7) the Student Records Survey. A final chapter considers the quality of data in the SASS overall. (Contains 1 figure, 91 tables, and 165 references.) (SLD)

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Quality Profile for SASS

Rounds 1-3: 1987-1995

Aspects of the Quality of Data in the Schools and Staffing Surveys (SASS)

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Quality Profile for SASS Rounds 1–3: 1987–1995

Aspects of the Quality of Data in the Schools and Staffing Surveys (SASS)

Graham Kalton, Marianne Winglee, Sheila Krawchuk, and Daniel Levine
Westat

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PREFACE

In 1994, the National Center for Education Statistics (NCES) published the *Quality Profile for SASS, Aspects of the Quality of Data in the Schools and Staffing Surveys (SASS)* (Jabine, 1994). The report presented and summarized the available information about the quality of data from the five surveys that comprised SASS during its first two rounds of data collection (1987-88 and 1990-91).

The present report, the second edition of the *Quality Profile for SASS*, updates the information from the earlier report and incorporates information about the quality of data from the various surveys that comprised SASS during its third round of data collection. The report also presents background on the survey design and procedures for each of the surveys. This report was prepared by Westat under contract to the National Center for Education Statistics, Contract No. RN 94093001, Task 30.

The current *Quality Profile* was prepared by Graham Kalton, Marianne Winglee, Sheila Krawchuk, and Daniel Levine of Westat. Significant contributions to the second edition were made by selected staff of both NCES and the U.S. Census Bureau. Specifically, at NCES, Steven Kaufman served as project coordinator, providing counsel, direction, and support to the effort. Kerry Gruber and Dan Kasprzyk provided relevant source materials and clarified the many technical issues that arose during the preparation of this report.

Since the main survey data collection and processing operations for SASS are carried out by the U.S. Census Bureau under an interagency agreement, selected source materials and the answers to a number of technical questions were obtained from members of the census staff, especially Dennis Schwanz, Randall Parmer, and Sharon Fondelier.

Peer reviewers for this report were Ellen Bradburn and Kathryn Chandler, Early Childhood, International and Crosscutting Studies Division, NCES; Beth Young, Elementary/Secondary and Libraries Studies Division, NCES; Dennis Schwanz, Census Bureau; Leslie Scott, Education Statistics Services Institute; and Thomas B. Jabine, statistical consultant. Marilyn McMillen, Statistical Standards Program, NCES, was the adjudicator for the peer review. The authors are indebted to those who contributed to this effort as reviewers and provided many valuable comments and suggestions.

As additional SASS data collection rounds are conducted, NCES plans to issue updated editions of the Quality Profile. Accordingly, comments and suggestions on the format and content are welcome.

1. INTRODUCTION AND OVERVIEW

1.1 INTRODUCTION

The Schools and Staffing Surveys (SASS) is an integrated system of periodic sample surveys providing information about teachers and administrators and the general condition of America's public and private elementary and secondary schools. Sponsored by the National Center for Education Statistics (NCES) of the U.S. Department of Education, SASS offers a source of data for policymakers, educators, education researchers, and the public.

NCES initiated SASS in the mid-1980s in response to needs for information about critical aspects of teacher supply and demand, the qualifications and working conditions of teachers and principals, and the basic conditions in schools as workplaces and learning environments. SASS has been conducted three times: Round 1 in 1987-88, Round 2 in 1990-91, and Round 3 in 1993-94. Round 4 is being fielded in the 1999-00 school year. At each round, NCES reviews the SASS content to expand, retain, or delete topics covered in the previous administration, maintaining the survey's capability for trend analysis, and adding new topics to address current concerns.

SASS is an integrated system of several surveys. The survey data are collected by mail, with telephone followup of nonrespondents. In the first two rounds, SASS comprised five components: the School Survey, the School Administrator Survey (now known as the School Principal Survey), the Teacher Demand and Shortage Survey (TDSS), the Teacher Survey, and the Teacher Followup Survey that was conducted the year after the core surveys. In Round 3, SASS added the Library Media Center Survey, the Library Media Specialist/Librarian Survey, and the Student Records Survey resulting in a system of eight surveys in total. Round 4 administers six of these surveys, excluding the Library Media Specialist/Librarian Survey and the Student Records Survey.

Purpose and audience. The purpose of *A Quality Profile for SASS* is to summarize what is known about the quality of data from the surveys that comprise SASS and to provide information about the survey design and procedures for each survey. Without such a summary, anyone wanting information about the quality of SASS estimates would have to search through a large body of literature, some of it not easily accessible. The *Quality Profile* draws on that literature and provides references for readers who want more detailed information.

This report will be of interest to users of SASS data, to persons responsible for various aspects of the design and operation of the surveys, and to anyone interested in the quality of survey data, especially data from mail surveys and surveys related to education. More specifically, the report provides the basis for a systematic review of past and ongoing research on the quality of SASS data, with a view toward identifying gaps in our knowledge and establishing priorities for future research activities.

Scope and structure of the report. This, the second edition of *A Quality Profile for SASS*, is a revision of the first edition (Jabine, 1994) that described the design and procedures used in Round 2, along with information on major changes between Rounds 1 and 2. This edition

expands on the first edition and discusses the progress and development of SASS from Rounds 1 through 3. Since Round 4 had not been completed at the time that this report was prepared, the report does not cover that round. However, some new features introduced in Round 4 are mentioned in relevant chapters.

There are several possible methods of organizing data on errors in surveys. The method used in this report follows the structure adopted in the first edition of the *Quality Profile for SASS*, namely presenting information on errors associated with each phase of survey operations: frame design and maintenance, sample selection, data collection, data processing, estimation, and evaluation of survey estimates. The report consists of nine chapters. Chapters 2 to 8 use this approach to describe, in turn, the quality of each of the SASS component surveys.

- The *School Survey* (chapter 2) is the core survey providing basic data on a sample of elementary and secondary schools, and it also serves as the sampling frame for the other surveys in SASS. It collects data on characteristics of both public and private schools, such as enrollment, student-staff ratios, programs and services offered, and length of the school day.

- The *School Principal Survey* (chapter 3) collects information about the demographic characteristics, training, experience, and salary of school heads/principals, and their judgments about the seriousness of school problems. This survey was known as the School Administrator Survey in Rounds 1 and 2. Its name was changed to the School Principal Survey in Round 3. For simplicity, it is referred to as the School Principal Survey throughout this report.

- The *Teacher Demand and Shortage Survey* (chapter 4) gathers data on teacher recruitment, hiring practices, teacher dismissals, existence of a teacher union, length of the contract year, teacher salary schedules, school choice, magnet programs, graduation requirements, and professional development for teachers and administrators. Information for public schools is obtained from the local educational agencies (LEAs), whereas private schools and BIA schools which are not part of an LEA are contacted directly. This survey is known as the School District Survey in Round 4.

- The *Teacher Survey* (chapter 5) collects data from teachers about their education, training, teaching assignment, certification, workload, and perceptions and attitudes about teaching.

- The *Teacher Followup Survey* (chapter 6) is conducted about 1 year after the Teacher Survey to measure teacher retention, mobility, and attrition from the profession in the intervening year.

- The *Library Media Center and Library Media Specialist/Librarian Surveys* (chapter 7). The data from the Library Media Center Survey provide a national picture of school libraries and permit an assessment of the adequacy of school libraries to meet the needs of students and staff. The separate Library Media Specialist/Librarian Survey collects data about school librarians, their educational background, work experience, and demographic characteristics, as well as duties, salaries, workload, and attitudes about their current position and their profession.

- The *Student Records Survey* (chapter 8) collects data that can be used to examine the distribution of school programs and teachers among students of differing demographic and academic characteristics and to describe the participation of students in school programs and services.

The topics discussed in chapters 2 through 8 for each of the surveys include potential sources of errors—noncoverage, unit and item nonresponse, measurement and sampling errors—and their possible impact on the accuracy of the survey estimates. Chapter 2 provides the most detail on those sample design and data collection procedures used in all the SASS surveys. Subsequent chapters often refer back to chapter 2 for these details.

Chapter 9 looks at SASS as a whole and broadens the discussion of quality to cover issues of relevance, accessibility, timeliness, and periodicity. This chapter also attempts to combine the findings from earlier chapters to identify key areas where efforts for methodological improvements might be most effectively directed and where further information is needed for the assessment of survey quality.

1.2 AN OVERVIEW OF SASS

Objectives. SASS is designed to provide periodic, timely data on public and private elementary and secondary schools in the United States. The analytical power of the data is enhanced by the ability to link survey data for individual LEAs, schools, teachers, and all other SASS components. The use of comparable questions in each round of SASS makes it possible to monitor changes in the nation's elementary and secondary education system. In each round, special inquiries can be included, subject to constraints on overall cost and burden on respondents.

In Rounds 1 and 2, SASS data provided a basis for addressing five major policy issues (Hudson and Darling-Hammond, 1987):

- *Teacher supply and demand.* In what teaching fields do shortages exist? What school characteristics influence teacher supply and demand? How do the characteristics of new hires compare with those of the existing workforce? What distinguishes teachers who leave the profession from those who stay in it? What incentives are used to recruit and retain teachers in areas of shortage?

- *Characteristics of elementary and secondary teachers.* How does the training and experience of teachers compare for different types of schools? How does teacher training relate to their fields of assignment? What are the characteristics of specific subgroups of teachers, such as bilingual teachers?

- *Teacher workplace conditions.* How are teachers affected by working conditions, including teaching workloads, student-teacher ratios, and resources available for teaching and professional development? How do teachers evaluate their working conditions?

- *Characteristics of school principals.* What education and experience do the nation's elementary and secondary school principals have? What problems do they consider to be serious, and how do they evaluate their influence on school policies?

- *School programs and policies.* How do schools vary with respect to admission requirements, graduation requirements, teacher salaries and benefits, teaching load, and staffing patterns? How do graduation and college application rates vary by school? How many schools have special programs, such as remedial reading and mathematics, programs for the disabled, programs for the gifted and talented, and extended daycare programs? How many students are served by these programs?

Round 3 added three new surveys to address policy issues regarding:

- *Student participation in school programs and services.* How are school programs and teachers distributed among students of differing demographic and academic characteristics?

- *Library facilities and librarians.* Are school libraries adequately equipped to meet the needs of students and teachers? What are the qualifications, experiences, and workloads of librarians?

In Round 4, the content of SASS emphasizes the measurement of conditions and practices related to school reform (NCES, 1999). New issues being examined in Round 4 include the following:

- *School practices.* What are the structure and processes of school organization, management, and decisionmaking, including the degree of authority and autonomy that teachers experience, and the influence of administrators, staff, teachers, and school site councils (or other decisionmaking bodies) on school policy and practice?

- *Parental involvement.* What are the school practices that encourage and support parental involvement in schools and build parenting skills related to education?

- *School safety.* How do principals and teachers view school safety and discipline problems? What measures do schools take to prevent and remediate them?

- *Charter schools.* What are the characteristics of charter schools? When were schools granted charter status and by whom? What types of regulations were waived to establish the schools? How many schools are new or converted from pre-existing schools? How many schools operate within a school district?

Evolution and changes in the SASS design. Round 1 of SASS in 1987-88 integrated the design and operations of three existing survey programs: the Public and Private School Surveys, the Teacher Surveys, and the TDSSs. Prior to initiating SASS, a Public School Survey, covering both schools and teachers, had been conducted for school year 1984-85, and Private School Surveys, which included teachers, had been undertaken in 1983-84 and 1985-86. Separate TDSSs, covering LEAs and private schools, had been conducted for school years 1978-79 and 1983-84 (NCES, 1992).

Round 2. There were significant changes between Rounds 1 and 2 of SASS in the sampling frames from which samples of public and private schools were selected and in the sample design for schools and teachers (see section 2.4). In Round 1, the primary frame for each sector was a list of schools purchased from Quality Education Data, Inc. (the QED list). For the private sector, the QED list was supplemented with lists obtained from several private school associations and by an area sample. In Round 2, the main public school frame for SASS was the list of schools developed from NCES's 1988-89 Common Core of Data (CCD), which included an annual census of LEAs and schools. For private schools, the 1988-89 QED list, supplemented by lists obtained from private school associations, was used as the frame for a universe survey, the 1989-90 Private School Survey (PSS). The list frame for the 1989-90 PSS was used to select the private school list sample for Round 2 of SASS. As in Round 1, the list frame was supplemented by an area sample, but the number of sample areas was increased from 75 to 123 (Gruber, Rohr, and Fondelier, 1993).

The sample design in Round 2 was modified to improve the estimates for certain domains. For instance, in the School Survey, domains of Bureau of Indian Affairs (BIA) schools and Native American schools (schools with 25 percent or more Native American students) were added. In the Teacher Survey, separate domains were included for Asian and Pacific Islander (API) teachers and for American Indian, Aleut and Eskimo (AIAE) teachers.

A new feature of the Round 2 sample selection process was a procedure to control the amount of overlap between the Round 1 and 2 school samples. The proportion of overlap varied by sector and by stratum within sector, based on an evaluation of the tradeoff between improved estimates of change (favoring more overlap) and expected effects on response rates (favoring less overlap) (Kaufman and Huang, 1993, Section 4). Additional design changes are described in chapters 2 to 6 for each of the SASS surveys.

The separate School and TDSS questionnaires used for private schools in Round 1 were combined to form a single Private School questionnaire in Round 2. Also, a new questionnaire was added for BIA schools outside the local public school system. This questionnaire also includes items for the School and TDSS.

Round 3. Round 3 incorporated further changes in content, design, and procedures. The Student Records Survey became a new component of SASS. Procedures for obtaining student data from school records were tested in the spring of 1993 and used in Round 3 for students in a subsample of schools. Round 3 also added the Library Media Center Survey and the Library Media Specialist/Librarian Survey, conducted among a subsample of schools in the School Survey.

The survey questionnaires were modified in various ways. Some questions that required considerable effort but yielded little usable information were dropped; others were reformatted for easier completion by respondents. Instructions for skipping items not relevant to all respondents were clarified. New items were added to provide information needed to monitor the National Education Goals for the year 2000, including data on topics such as school safety and drug use by students.

Round 4. In Round 4, charter schools have been included as a new domain, with separate data to be provided for this group of schools, their principals, and their teachers. The Round 4 SASS, covering the 1999-00 school year, also shifts the survey emphasis from teacher supply and demand issues to the measurement of teacher and school capacity, both objectives of recent school reform agenda (see Mullens and Kasprzyk, 1997; NCES, 1999). Since there is evidence to suggest that schools and school districts may reconcile imbalances in teacher supply and demand by adjusting the level of teacher quality accepted (see Bobbitt, 1995; Broughman and Rollefson, 1995), issues of teacher quality are of increased concern. The Round 4 SASS highlights issues pertaining to teacher qualifications and career paths, and places more emphasis on teacher professional development.

Periodicity. Rounds 1 to 3 of SASS were administered at 3-year intervals, in 1987-88, 1990-91, and 1993-94. The interval between Round 4, administered in 1999-00, and Round 3 was extended to 6 years, because of both budget and redesign considerations. SASS is currently planned on a 4-year cycle; Round 5 will take place in 2003-04.

Sample design. The sample schools in the SASS School Survey are the core link to other SASS samples. Figure 1-1 shows the Round 3 SASS samples and the links between them. The sample selection involves the following steps:

(1) A sample of schools is selected for the School Survey. The sample is designed to provide separate estimates for public, private, BIA, and Native American schools.

(2) The same sample of schools selected for the School Survey is used for the School Principal Survey.

(3) Each LEA that administers one or more of the public schools selected for the School Survey becomes part of the sample for the TDSS. Each round also included a supplemental sample of LEAs that did not administer schools. For the private sector and BIA schools which are not part of an LEA, the data for the TDSS are collected from the schools sampled for the School Survey as part of the questionnaire for that survey.

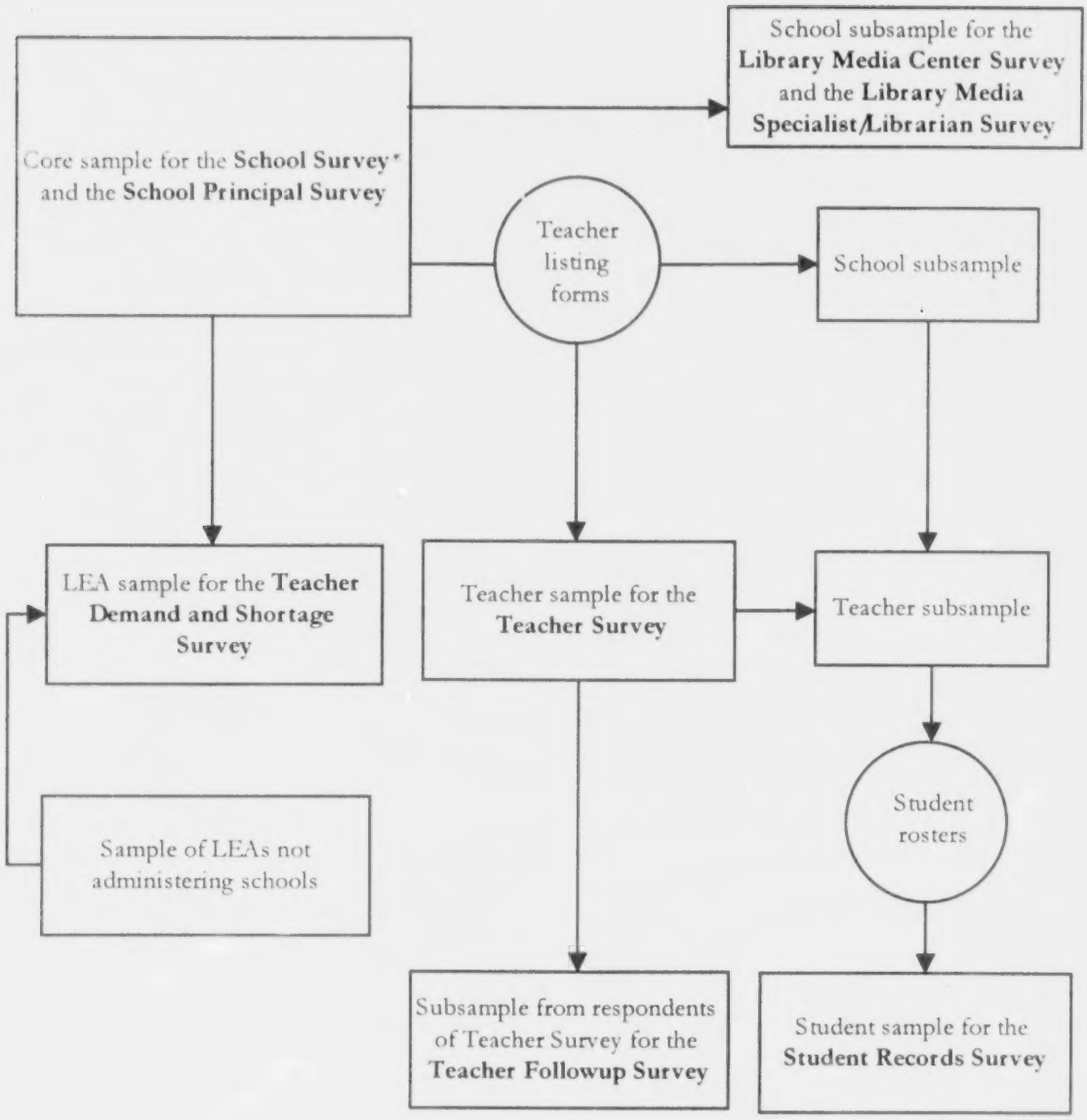
(4) For each sample school, a list of teachers is obtained and a sample of teachers is selected for the Teacher Survey.

(5) The Teacher Followup Survey takes place in the school year following the basic SASS surveys. Its sample is selected from the respondents to the Teacher Survey and includes a subsample of those who continue teaching at the same or another school and all those who are no longer teaching in an elementary or secondary school.

(6) A subsample of schools included in the School Survey is selected for the Library Media Center and Library Media Specialist/Librarian Surveys.

(7) Another subsample of schools (selected with minimum overlap with the schools selected for the Library Media Center and Library Media Specialist/Librarian Surveys) is selected for the Student Records Survey. Within these schools, the sample teachers for the Teacher Survey are subsampled, and students are selected from the sample teachers' class rosters.

Figure 1-1. —The Round 3 (1993-94) SASS samples


Core sample for the **School Survey*** and the **School Principal Survey**
School subsample for the **Library Media Center Survey** and the **Library Media Specialist/Librarian Survey**
Teacher listing forms
School subsample
LEA sample for the **Teacher Demand and Shortage Survey**
Teacher sample for the **Teacher Survey**
Teacher subsample
Sample of LEAs not administering schools
Student rosters
Subsample from respondents of Teacher Survey for the **Teacher Followup Survey**
Student sample for the **Student Records Survey**

*For private schools and certain BIA schools, the Teacher Demand and Shortage Survey is part of the School Survey.

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Table 1-1 shows the sample sizes for the SASS surveys in Rounds 1 through 3 and the approximate sample sizes in Round 4. The school counts in Round 1 reflect a somewhat different definition of schools from that used in subsequent rounds; the difference, however, is small (see section 2.4). Round 4 also includes samples of about 1,100 charter schools and their principals, and 5,000 teachers who work in them.

Table 1-1.—Sample size of each survey in SASS, by sector: Rounds 1-4

SASS surveys and sectors	Number sampled			
	Round 1[1] (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)	Round 4[2] (1999-00)
Public				
School	9,317	9,587	9,956	9,800
Principal	9,317	9,587	9,956	9,800
LEA	5,594	5,424	5,459	5,500
Teacher	56,242	56,051	56,736	57,000
Library Media Center	‡	‡	4,994	9,800
Library Media Specialist/Librarian	‡	‡	4,994	‡
Student records	‡	‡	5,095	‡
Private				
School	3,513	3,270	3,360	3,400
Principal	3,513	3,270	3,360	3,400
Teacher	11,529	9,166	11,548	12,000
Library Media Center	‡	‡	2,500	3,400
Library Media Specialist/Librarian	‡	‡	2,500	‡
Student records	‡	‡	1,236	‡
BIA				
School	‡	101	176	200
LEA	‡	101	176	200
Teacher	‡	—	—	1,000
Library Media Center	‡	‡	122	200
Library Media Specialist/Librarian	‡	‡	122	‡
Student records	‡	‡	602	‡

‡Not applicable. (The survey was not administered in that round.)
—Not available.
[1]The Round 1 public school sample includes the BIA schools listed separately in Rounds 2 to 4. Round 1 also used a slightly different definition of schools; the difference, however, was small (see section 2.4).
[2]The sample sizes for Round 4 are approximate. Round 4 also includes samples of about 1,100 charter schools and principals and about 5,000 teachers who work in them. These samples are not included in this table.
SOURCES: NCES (1991a,b,c,d); Gruber, Rohr, and Fondelier (1993,1996); NCES (1999).

Survey Operations. The main survey operations, including sample selection, data collection and data processing, are carried out by the U.S. Census Bureau under an interagency agreement, according to specifications provided by NCES. Questionnaires are mailed to sample schools, addressed to the principal or directly to sample teachers. For the Teacher Survey in Round 1

only, teacher questionnaires were mailed to school coordinators who distributed them to the sample teachers in their schools. Completed questionnaires are returned by mail to the Census Bureau's clerical processing office in Jeffersonville, Indiana.

The data collection processes for SASS typically involve an initial mailing of the questionnaires, a second mailing to nonrespondents, and followup telephone interviews to mail nonrespondents. Round 3 introduced the use of a reminder postcard sent about one week after the initial mailing to all sample units. Prior to Round 3, nonrespondents to the second mailing were contacted by telephone by U.S. Census Bureau interviewers—known as field representatives—working from their homes or from Census regional offices, using paper-and-pencil questionnaires. In Rounds 3 and 4, nonresponse followup has mostly been accomplished through centralized computer-assisted telephone interviewing (CATI) by U.S. Census Bureau field representatives. LEA nonrespondents were followed up by regional field office staff using paper-and-pencil questionnaires in Round 3; they are designated for CATI followup in Round 4.

Table 1-2 summarizes the data collection schedules for Rounds 1 to 4. In an attempt to increase response rates and to allow time for completing all components of the data collection activities, the initial mailouts of questionnaires have moved progressively earlier over the four rounds, in order to reach the different respondents, whether principals, teachers, or school officials, earlier in the school year. Thus, whereas in Round 1 the data collection effort ran from November to June, by Round 4 it began in August and is scheduled to end in June.

Use of SASS data. SASS produces a range of products, including publications and data files stored on tapes or CD-ROMs. Disseminating SASS data to the greatest number of users and in a form that is appropriate, usable, and accessible is an ongoing concern in SASS. The technical report *SASS Schools and Staffing Survey* (NCES, 1999) provides an overview of SASS and a summary of SASS publications. Two separate studies address the issue of customer needs and satisfaction. *Tracking Secondary Use of the Schools and Staffing Survey Data: Preliminary Results* (Wiley and Reynolds, 1999) identifies individuals and institutions using SASS data for research purposes. *What Users Say About Schools and Staffing Survey Publications* (Rouk, Weiner, and Riley, 1999) reviewed the purposes of SASS publications, based on a survey of users and comments collected from a focus group discussion on how SASS data are communicated in print. The results of these studies will be used to improve the dissemination of SASS data with the aim of expanding their use.

1.3 SOURCES OF INFORMATION ABOUT SASS

Sources of information about sampling and nonsampling errors. Errors in surveys are of two kinds: sampling and nonsampling errors. Sampling errors are the result of basing survey estimates on a sample rather than all units in the population of interest. Nonsampling errors can occur at any stage of a survey, including sample selection, data collection, data processing, and estimation. This report covers both sources of error; however, the primary emphasis is on the nonsampling error.

Sampling errors. SASS data users requiring detailed guidance on how to take sampling errors into account in their analyses should refer to the *SASS Data File User's Manual* provided with the data files for each round (NCES, 1991a, b, c, d; Gruber, Rohr, and Fondelier, 1993 and

Table 1-2.—SASS data collection schedules: Rounds 1-4

Form/questionnaire	Initial mailout	Begin followup	Complete collection
Round 1 (1987-88)			
Teacher listing form	November 1987	December 1987	January 1988
School district (public schools)	January 1988	April 1988	June 1988
School principal	January 1988	April 1988	June 1988
School	January 1988	April 1988	June 1988
Teacher	January 1988	April 1988	June 1988
Teacher followup	March 1989	April 1989	July 1989
Round 2 (1990-91)			
Teacher listing form	October 1990	November 1990	December 1990
School district (public schools)	December 1990	March 1991	June 1991
School principal	January 1991	March 1991	June 1991
School	January 1991	March 1991	June 1991
Teacher	January 1991	March 1991	June 1991
Teacher followup	January/February 1992	March 1992	May 1992
Round 3 (1993-94)			
Teacher listing form	September 1993	November 1993	February 1994
School district (public schools)	October 1993	January 1994	June 1994
School principal	October 1993	January 1994	June 1994
School	December 1993	March 1994	June 1994
Teacher	December 1993	March 1994	June 1994
Library/librarian	October 1993	March 1994	June 1994
Student records	March 1994	March 1994*	June 1994
Teacher followup	January 1995	February 1995	May 1995
Round 4 (1999-00)			
Teacher listing form	August 1999	October 1999	February1999
School district (public schools)	September 1999	January 2000	May 2000
Principal	September 1999	November 1999	April 2000
School	September 1999	January 2000	April 2000
Teacher	November 1999	January 2000	June 2000
School library media center	September 1999	November 1999	April 2000

*For those schools that would not select student samples by phone, a personal visit to the school was arranged, beginning in March, to select the student sample and to complete the student records questionnaire. Followup for other schools that had not returned completed student records questionnaires began in April.

SOURCES: NCES (1991a,b,c,d); Gruber, Rohr, and Fondelier (1993,1996); NCES (1999).

1996). All publications based on SASS data include information about sampling errors of SASS estimates. Each publication in the Education Data Tabulations (ED Tabs) series (e.g., Bobbitt, Gruber, and Leich, 1993; Bobbitt, Broughman, and Gruber, 1995) includes separate tables with sampling errors for selected estimates included in the publication. The publications that summarize results of SASS for each round (Choy, Medrich, Henke, and Bobbitt, 1992; Choy, Henke, Alt, Medrich, and Bobbitt, 1993; Henke, Choy, Geis, and Broughman, 1996) include tables showing the estimated standard error for each estimate discussed in the text of the report and a table showing standard errors for selected public school estimates at the state level. Generalized variance functions, which provide approximations of sampling errors for all

estimates, based on their size, have been developed for the School, Principal, TDSS, and Teacher Surveys for Rounds 1 and 2 (Salvucci and Holt, 1992; Salvucci, Galfond, and Kaufman, 1993; Salvucci, Holt, Moonesinghe, and Kaufman, 1994; Salvucci, Weng, and Kaufman, 1995).

Nonsampling errors. Information about nonsampling errors comes from several sources:

- Operational or performance data, including unit and item response rates, results of supervisory reviews of interviewers' work, results of reinterviews, and pre-edit and edit failure rates.

- Findings from pretests, in-depth group and individual interviews, and methodological experiments.

- Micro-evaluation studies, in which the accuracy of a sample of individual responses is evaluated by various means, such as intensive reinterviews or comparison with existing records.

- Macro-evaluation studies, in which the differences between survey estimates and comparable estimates from other sources are analyzed. Such studies may involve data from two or more SASS surveys or they may compare SASS data with those from other NCES surveys or from surveys conducted by other organizations, such as the U.S. Census Bureau.

This report draws on all of these sources. It is based almost entirely on existing documentation with minor exceptions; no new tabulations or analyses were undertaken to provide new material.

Additional sources of information. The references cited in this report include several kinds of NCES publications. The *Data File User's Manuals* (sometimes referred to as codebooks) are the most comprehensive source of information about the data available for analyses.

- Round 1—In Round 1, five separate 1987-88 *Data File User's Manuals* (NCES, 1991 a,b,c,d; Faupel, Bobbitt, and Friedrichs, 1992) are available, one for each of the basic SASS surveys—School, School Principal, TDSS, and Teacher—and one for the Teacher Followup Survey. The manual for each of the four basic surveys contains a common section describing the survey design and procedures for these surveys, followed by documentation of the data files and copies of the questionnaires for the specified survey. The manual for the Round 1 Teacher Followup Survey is specific to that survey.

- Round 2—For Round 2, the *1990-91 Data File User's Manual* covers all four of the basic surveys (Gruber, Rohr, and Fondelier, 1993). Volume I describes the design and procedures for the surveys, Volume II provides documentation of the restricted-use survey data files, and Volume III provides documentation of the public-use data files. A separate *1990-91 Data File User's Manual* also has been released for the Round 2 Teacher Followup Survey (Whitener, Rohr, Bynum, Kaufman, and King, 1994).

- Round 3—The Round 3 *1993-94 Data File User's Manuals* for the basic surveys (Gruber, Rohr, and Fondelier, 1996) and the Teacher Followup Survey (Whitener, Gruber, Rohr, and Fondelier, 1998) follow the same structure as the Round 2 manuals but provide more detailed

information about the edit and imputation procedures applied to each data item in the questionnaires.

Another useful source of information about the SASS surveys is the *Sample Design and Estimation Report* for each round. Kaufman (1991) gives a detailed description of the sample design and estimation for the four basic surveys in Round 1. Comparable reports are available for Round 2 (Kaufman and Huang, 1993), and Round 3 (Abramson et al., 1996).

A third source consists of the papers presented at the annual meetings of the American Statistical Association (ASA) on various aspects of SASS methodology and the quality of SASS data. These papers are generally published in the *Proceedings of the Section on Survey Research Methods*. NCES also publishes a working paper almost every year that compiles selected ASA papers concerned with SASS (NCES, 1994, 1995, 1996, 1997).

Users can gain access to SASS publications, data, and questionnaires from the SASS Home Page, **http://nces.ed.gov/surveys/sass**. They can also communicate with SASS staff through email to **sassdata@ed.gov**; this address gives a list of addresses of contact persons who can assist users with SASS questions.

This report relies on published sources whenever possible, but much of the information comes from unpublished memoranda and reports. Readers who would like to obtain copies of these items or who have questions about SASS findings and methodology should write to:

SASS Quality Profile
National Center for Education Statistics
1990 K Street, N.W.
Washington, D.C. 20006
sassdata@ed.gov

2. THE SCHOOL SURVEY

2.1 INTRODUCTION

The School Survey is the core survey in the Schools and Staffing Surveys (SASS), providing basic data on elementary and secondary schools in the United States and serving as a sampling frame for the other surveys in SASS. The School Survey has provided school data for 1987-88 in Round 1, 1990-91 in Round 2, and 1993-94 in Round 3 and data are currently being collected for 1999-00 in Round 4. The sample for Rounds 1 to 3 consisted of about 13,000 schools, of which almost three-quarters were public schools and the remaining quarter were private schools. Close to one-third of the schools provided data for two consecutive rounds. The sample size meets the key requirements of producing state estimates for public schools, estimates by association or affiliation group for private schools, and beginning in Round 2, estimates for schools listed on the Bureau of Indian Affairs' (BIA) Program Education Directory. Round 4 added a sample of over 1,100 charter schools to provide national estimates for such schools. Schools receive questionnaires by mail, and with telephone followup of mail nonrespondents, the response rates for the School Surveys have been high: over 95 percent for BIA schools, 92 percent for public schools, and almost 85 percent for private schools.

The survey questionnaires in Rounds 2 and 3 consisted of three separate forms: public schools receive form SASS-3A, private schools receive form SASS-3B, and BIA schools outside the local public school system receive form SASS-3C. A new form has been added for charter schools in Round 4. The core components of these questionnaires are quite similar and include basic school characteristics, staffing patterns, and school policies. The forms for private schools and BIA schools also contain items pertinent for these schools and items that appear on the Teacher Demand and Shortage Survey (TDSS) for local education agencies (LEAs) of public schools. Section 2.5 reviews the contents of the questionnaires for each round.

The rest of this chapter summarizes the quality issues of the School Survey in seven sections: definitions and types of schools in the survey (2.2); sample design choices (2.3); the school samples—frame, selection, sample size, and coverage issues (2.4); questionnaire content (2.5); data collection, measurement error studies, and nonresponse (2.6); data processing and estimation (2.7); and evaluations of school estimates (2.8).

2.2 DEFINITIONS AND TYPES OF SCHOOLS

The *target population* for the School Survey is all elementary and secondary schools in the United States in operation during the reference school year (1987-88, 1990-91, 1993-94, and 1999-00. Schools with no students in any of grades 1 to 12 are considered out of scope and excluded. Thus, schools offering only kindergarten, prekindergarten, postsecondary, and adult education programs are excluded.

Elementary schools are schools with a grade below 7 and no grade above 8. *Secondary schools* are schools with any span of grades beginning with grade 7 or above and ending with or below grade 12. *Combined schools* are schools with any span of grades that includes a grade lower than 7 and a grade higher than 8. Nonregular schools, such as special education, vocational,

technical, adult education (if part of an in-scope school), and alternative or continuation grade schools, are classified as combined schools.

A *public school* is defined as an institution that provides educational services, has one or more teachers to give instruction, is located in one or more buildings, receives public funds as primary support, and is operated by an education agency. An additional requirement beginning at Round 2 is that the institution has an assigned administrator. This definition of public school includes schools in juvenile detention centers, schools associated with publicly operated hospitals, schools located on military bases and operated by the U.S. Department of Defense (DOD), and schools affiliated with the BIA and operated by LEAs. BIA schools operated outside the local public school system are excluded.

A *BIA school* is defined as an educational or residential center funded by and operated by, or under contract with, the BIA that offers services to American Indian students. The school can occupy one or more buildings and may be a day school, a boarding school, previously a private school, a cooperative school, or a contract school. Schools operated outside the local public school system by Indian tribes or by Indian tribes under contract with the BIA also are classified as BIA schools.

A *Native American school* is a public school with 25 percent or more American Indian or Alaskan Native students.

A charter school is a public school that, in accordance with an enabling state statue, has been granted a charter, exempting it from selected state or local rules and regulations. A charter school may be a newly created school or it may have converted from a pre-existing public or private school.

A *private school* is a school not in the public system that provides instruction for any of grades 1 to 12 where the instruction is not given exclusively in a private home. A private school is out of scope if it has no students in any of grades 1 to 12, if it operates in a private home used as a family residence, if it has fewer than 10 students, or if it has only one teacher.

Private schools in the United States are diverse in orientation and affiliation. Many private schools are affiliated with a religious body (e.g., Catholic, Evangelical Lutheran Church in America, and Seventh Day Adventist). Other private schools are members of an association of schools (e.g., National Association of Independent Schools and National Association of Private Schools for Exceptional Children). Some schools with religious affiliations are also members of associations and some religious schools do not have a formal association with any organized religious group or religious association. The SASS School Survey treats some of the association groups as subdomains for which separate estimates of adequate precision are required (the association groups are shown in table 2-5).

2.3 SAMPLE DESIGN CHOICES

The sample design for the School Survey is a compromise design that meets the multiple objectives for SASS and takes into consideration the response burden for schools. This section discusses the four basic goals of the survey and how each of these goals guided the choice of

sample design. The four goals discussed are the following: providing reliable domain estimates; balancing the requirements of the School Survey and other SASS surveys; controlling sample overlap between SASS and other National Center for Education Statistics (NCES) surveys of elementary and secondary schools; and controlling sample overlap between rounds of SASS surveys.

Providing domain estimates. The main design objective of the School Survey is to provide estimates of school characteristics by key analytical domains. The following are domains for school estimation:

- The nation as a whole;
- The public and private sectors separately;
- Elementary, secondary, and combined schools, separately for the public and private sectors;
- BIA and Native American schools separately (since Round 2);
- Elementary and secondary public schools, separately by state (since Round 2); and
- Private schools by association group, region, and school level (elementary, secondary, and combined).

The optimum allocation for each of the key domains of estimation is different. For national estimates, the number of sample schools should be made proportional to the total number of schools within each stratum. However, for state comparisons, the optimal allocation is one in which each state gets an equal sample allocation. Using the optimum allocation for state comparisons would provide less efficient national estimates (e.g., California would get the same sample size as Delaware even though California contributes more to the national variance than Delaware). Likewise, the optimum allocation for sector is different from the optimum allocation for level. In other words, optimizing the allocation for one goal results in less efficient estimates for another goal. For this reason, Round 1 of the School Survey used a compromise allocation that took into account the loss of efficiency relative to the optimum allocation for each of the four domains (national, state, level, and sector) and for both school and teacher estimates (see Kaufman, 1991).

The sample allocations for subsequent rounds modified it somewhat to improve the precision of elementary and secondary school estimates by state for the public school sector. For the private school sector, the design was modified to support estimation by private school association group, census region, and school level.

Section 2.4 describes in more detail the sample allocation and design changes for the public and the private school samples by round. The overall design to support estimation by domain involves stratifying schools by sector and by domain within each sector. The allocation of sample schools among the strata is designed to provide estimates of acceptable precision for each of the analytical domains. The general approach is to select a specified minimum number of schools (about 80 for public schools and 100 for private schools) in each of the domains and to

allocate the remaining sample of schools in a way that optimizes the precision of estimates aggregated over domains, such as national estimates for public and private schools.

Balancing the requirements of the samples in SASS. As the core survey in SASS, the School Survey serves as a sampling frame for the other SASS surveys. The links between the school sample and the samples for the other SASS surveys are displayed in figure 1-1 in chapter 1. These links led to the need for some tradeoffs in the sample design for the School Survey. The tradeoffs involving the LEA sample associated with public schools and the sample of teachers in all schools are summarized below.

Sampling schools and LEAs. For the public school sector, two design alternatives were considered in Round 1 for linking the school and the LEA samples. One alternative starts with the selection of a sample of LEAs and then selects a sample of schools in those LEAs. The other alternative selects a sample of schools first and then identifies the LEA sample as the LEAs in which the sampled schools are located.

The tradeoff between the two designs is that the LEA-first design improves the reliability of the LEA estimates but reduces the reliability of both school and teacher estimates relative to the school-first design. Wright (1988) compared these two design alternatives in a simulation study. The results showed that the LEA-first design produced less reliable school and teacher estimates than the school-first design; however, the school-first design produced only slightly less reliable LEA estimates than the LEA-first design. Based on these results, SASS has been using the school-first design since Round 1.

Sampling schools and teachers. The design issue involving the relationship of the school and the teacher samples concerns the school selection probabilities:

- The greatest precision for school estimates would be achieved by selecting schools with equal probability within each stratum. However, this design is inefficient for the teacher sample. If schools are selected with equal probability, within each stratum teachers need to be selected within sampled schools at a constant rate in order to give them overall equal probabilities within the stratum. This design leads to a large variation in the number of teachers selected per school and undue response burden for some schools. The undue burden could be avoided by restricting the teacher sample size per school, but that destroys the equal probability feature of the teacher sample, and hence leads to the need for weighting adjustments in the analysis.

- For the teacher sample, an optimum design would select schools with probabilities proportionate to estimated size (i.e., proportionate to the number of teachers at the schools on the frame), and then would select teachers within schools at a rate that would make the overall selection probability for teachers constant within strata. However, this design would result in schools with many teachers having considerably higher probabilities of selection than schools with few teachers. The large variation in the selection probabilities of schools would result in a major loss of precision in the school estimates.

In place of either of these approaches, SASS adopted a compromise solution that balances the requirements of the two samples, namely, selection of schools with probability proportionate to

the square root of the number of teachers. Teachers within schools are then sampled at a rate that makes the overall selection probability for teachers approximately constant within strata, subject to the constraints of sampling at least one and no more than 20 teachers per school. The square root of the number of teachers is the geometric mean between the two alternative measures of size discussed above—the number of teachers as is optimal for the teacher sample and unity as is optimal for the school sample. The use of this compromise allocation avoids the substantial losses in precision for one of the surveys by using the measure of size that is optimal for the other survey. With the compromise measure of size, both surveys should be subject to only modest losses in precision compared with their optimum designs. The square root compromise measure of size is also used in some other surveys with differing units of analysis, such as some surveys in the NCES Fast Response Survey System.

Controlling sample overlap between SASS and other NCES school surveys. NCES periodically conducts a number of surveys of elementary and secondary schools, and the data collection periods of its school surveys sometimes overlap. Accordingly, an initial design concern in Round 1 was to minimize any sample overlap between the School Survey and any other concurrent NCES school surveys in order to avoid the burden on schools of having to respond to more than one survey at the same time.

During the data collection period for Round 1, NCES was also collecting data for two other surveys of elementary and secondary schools: the National Assessment of Educational Progress (NAEP) and the National Educational Longitudinal Study (NELS) of 1988. All three surveys used the Quality Education Data (QED) file as the basic sampling frame, but they had different selection probabilities and frame specifications. To minimize the response burden on individual schools, the samples for these three surveys were selected in a manner that minimized the overlap in sampled schools. A sequential procedure was used. First the NAEP sample was selected, then the NELS sample was selected using a procedure that avoided overlap with the NAEP sample while retaining the NELS selection probabilities (see Spencer et al., 1990), and finally the SASS sample was selected using a procedure that minimized the overlap with NAEP and NELS while retaining the SASS selection probabilities (see Kaufman, 1993, appendix 1). The procedure limited the overlap in the SASS sample to four schools in common with the NAEP sample. The SASS sample had no schools in common with the NELS sample.

A comparable procedure was not required in Round 2 because no other NCES surveys were in the field at the time. Round 3 of SASS coincided with the 1993-94 NAEP data collection, but no control over sample overlap was employed for this round. Kaufman (1999) found no evidence of a negative effect on school response rates to Round 3 of SASS due to sample overlap with the 1993-94 NAEP.

Round 4 of SASS is being conducted in the same school year as the 1999-00 NAEP. The NAEP sample was selected first, and then the SASS sample was selected using a procedure to minimize overlap. Since there is interest in the joint analysis of the school data collected in SASS and the student achievement data collected in NAEP, a special study is also planned to collect both sets of data from a supplemental sample of about 800 public schools (400 schools with grade 4 and 400 schools with grade 8). The benefits of a SASS-NAEP linkage are discussed by Skaggs and Kaufman (2000).

Controlling sample overlap between rounds. Some schools sampled for one round of SASS may also be sampled for the following round. The decision about how much the samples for two successive rounds should overlap involves a tradeoff between the anticipated favorable and unfavorable effects of overlap. To provide estimates of change between rounds with maximum precision, the overlap should be as great as possible. However, it was thought that response rates for schools selected for a second time might be lower than for those selected for the first time. The overlap issue is further complicated by the fact that overlap in the sample of public schools guarantees overlap in the sample of LEAs associated with them.[1] A Round 2 pretest conducted early in 1990 estimated that overlap would reduce the response rate by 5 percent for schools and 11 percent for LEAs.

The decision at Round 2 was to set the sample overlap for public schools at 30 percent, with a resultant LEA overlap rate of about 58 percent. Private schools had substantially lower response rates than public schools in Round 1 (see table 2-11), which raised concerns about the extent of overlap. For schools in association groups not sampled with certainty, the decision was to control, where feasible, the private school overlap of the list sample at 30 percent for school association groups with high response rates (close to 85 percent or more), to minimize overlap for the association groups with low response rates (below 80 percent), and to aim at a level less than 30 percent, but more than the minimum, for the association groups with response rates between 80 and 85 percent (see Kaufman and Huang, 1993, part 4). Another component of the private school sample is a sample of unlisted schools found in a sample of areas (primary sampling units or PSUs). For this component, SASS uses the area sample originally selected for the Private School Survey (PSS); the PSS control for PSU overlap is discussed in section 2.4.2. The SASS area sample schools were selected independently in the PSUs selected for both rounds with no attempt to control overlap between rounds.

The decision at Round 3 was to maintain the same sample overlap rates as Round 2 for both public and private schools. The target sample overlap for public schools was again set at 30 percent. For private schools, the control of overlap for each association group used the same approach as that used in Round 2. The procedures used to control overlap are discussed in Abramson et al. (1996, appendix 2). Round 4 does not control for sample overlap with Round 3 because of the longer interval between rounds.

2.4 SELECTING THE SCHOOL SAMPLE

The samples of public and private schools for the School Survey are selected using different frames and procedures. This section discusses the public school samples in Rounds 1 to 3, for example, frame construction, sample selection, and sample sizes (2.4.1); the private school samples—dual frames, sample selection, and sample sizes (2.4.2); and coverage and other frame issues (2.4.3). The estimation of sampling errors is discussed in section 2.7.5.

[1] The LEA overlap rate for Rounds 1 and 2 was expected to be about 47 percent if schools in the two successive rounds were selected as independent samples.

2.4.1 Public school samples

The *sampling frame* for the Round 1 public school sample was the 1985-86 QED, an annual database prepared by Quality Education Data Incorporated, a private research and database company in Denver, Colorado. The primary frame for Rounds 2 and 3 was the CCD, an NCES database compiled from administrative record data reported annually by state education agencies (SEAs). Round 2 used the 1988-89 CCD school file, and Round 3 used the 1991-92 CCD school file. Both the QED and the CCD files are universe files that are intended to include all elementary and secondary schools in the United States. McMillen, Kasprzyk, and Planchon (1994) discuss the sampling frames managed by NCES and efforts to assure quality and integrate the sampling frames for major NCES surveys.

QED and CCD schools. The CCD and the QED define schools slightly differently. While schools on the QED are listed as physical locations, those on the CCD are shown as administrative units. For example, an elementary school and high school at the same physical location but with two different principals would be counted as one school on the QED list but as two schools on the CCD list. In contrast, a consolidated school district might have a high school that gathers in two buildings, at two physical locations, but is administered as one high school. This case would be listed as two schools on the QED but as one school on the CCD.

Frame construction. The construction of the public school sampling frame at each round included steps to remove duplicate schools, schools operated by the DOD outside the United States, and schools that offered only kindergarten and prekindergarten or adult education. As an example, the 1991-92 CCD school file used as the primary list frame for Round 3 contained a total of 86,287 public schools. Frame cleaning removed 3,451 schools (about 4 percent of the schools on the CCD file), leaving 82,746 schools that were considered to be in-scope for SASS. For the preceding rounds, the public school sampling frame contained 80,384 in-scope QED schools in Round 1 and 83,165 in-scope CCD schools in Round 2.

The *public school sample* for each round was a stratified probability sample. The allocation of sample schools among the strata was designed to provide estimates of acceptable precision for each of several analytical domains (see section 2.3). The *Sample Design and Estimation* reports (Kaufman, 1991; Kaufman and Huang, 1993; Abramson et al., 1996) provide the details of the sampling processes in each round. Briefly, schools in the frame were first stratified by analytic domain. Within each stratum, the schools were next sorted by LEA characteristics (e.g., urbanicity, percent minority student enrollment, and ZIP Code) and by school characteristics (e.g., highest grade in the school and school enrollment). Following the sort operation, the specified number of schools was selected systematically with schools selected with probability proportionate to the square root of the number of teachers as reported on the frame. The procedure of systematic sampling from the sorted lists was employed in order to satisfy the requirements of the LEA sample and to gain the benefits of implicit stratification by the sort variables. Prior to sampling, all schools with a measure of size that exceeded the sampling interval for the stratum were removed from the sampling frame and selected with certainty. For the remaining schools, the controls on overlap with the sample from the preceding round were built into this part of the selection process (see Kaufman and Huang, 1993, appendix 3, and Abramson et al., 1996, appendix 2).

Beginning with Round 2, the LEAs in Delaware, Nevada, and West Virginia were treated as separate strata and at least one school was sampled per LEA thereby ensuring that all LEAs in these states were included in the LEA sample. Prior to Round 2, a simulation study was conducted to assess the reliability of SASS LEA estimates for each state. The study showed that the standard errors of LEA estimates for these three states were very high even with a very high sampling rate. By including all LEAs in the sample with certainty, there are no sampling errors for LEAs estimates in these states (see Kaufman and Huang, 1993, p. 45).

Sample sizes. Table 2-1 shows the sample sizes of public schools in the School Survey in Rounds 1 to 3. Round 1 used the QED frame and the sample allocation designated the selection of a sample of 9,331 public schools. The actual number of schools sampled, 9,317 schools, was slightly different from the designated sample size because of the procedures included to control for sample overlap with other surveys. Rounds 2 and 3 used CCD frames, and BIA schools and Native American schools were assigned to separate strata for sampling. To facilitate comparisons with Round 1, Round 2 sampled CCD schools grouped according to the QED school definition. After sample selection, the CCD definition of a school was applied to the selected units, which resulted in a slightly larger sample of schools. As explained earlier, CCD defines schools based on administrative units and QED defines schools based on physical locations. There can be multiple school administrative units at one physical location. Round 3 sampled schools as listed on the CCD frame. The actual number of schools sampled differed slightly from the sample allocation because of the procedures included to control sample overlap with Round 2.

Table 2-1.—Allocated and actual sample sizes of public schools in the School Survey: Rounds 1-3

Types of public school	Sample size*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total sample allocation	9,331	9,688	9,960
Public	9,331	9,336	9,333
BIA	‡	101	176
Native American	‡	251	451
Combined	1,430	1,531	1,396
Elementary	4,994	4,435	4,542
Secondary	2,907	3,722	4,022
Actual sample selected	9,317	9,897	9,956

‡Not applicable. (Not listed as a separate category.)
*Round 1 sampled from a QED school frame. Round 2 used a CCD frame; however, schools were grouped by QED school definition for sampling, and each CCD school in the sample received a separate questionnaire for data collection. Round 3 sampled schools as listed on the CCD frame.
SOURCES: NCES (1991a); Gruber, Rohr, and Fondelier (1993, 1996).

The Round 2 sample design allows for the calculation of school, principal, and teacher estimates using either the QED or the CCD definition of a school (see Holt and Scanlon, 1995; and Kasprzyk et al., 1994). The results of such calculations showed that only a small percent of the CCD-defined schools needed to be adjusted to meet the QED school definition. Only 264 out of over 9,300 CCD schools sampled in Round 2 were adjusted to meet the QED definition. These schools were mostly in rural or small towns and were concentrated in six states. North Dakota, South Dakota, Iowa, Nebraska, Minnesota, and Texas.

By school level, the Round 1 public school sample included about 1,400 combined schools, 5,000 elementary schools, and 3,000 secondary schools. Rounds 2 and 3 allocated a larger sample to secondary schools as part of a design change to improve the precision of estimates for secondary schools by state.

Sample size by state. Table 2-2 shows the allocation of the public school sample and the percent of schools sampled by state for Rounds 1 to 3. As noted above, Round 1 used a QED frame for sampling, Round 2 used a CCD frame with schools on the frame grouped according to QED school definition for sampling, and Round 3 used a CCD frame with schools sampled as listed on the frame.

As compared with Round 1, Rounds 2 and 3 allocated larger samples of schools to small states and smaller samples to large states in order to improve the precision of the estimates for small states. For example, the school sample in Utah rose from 75 schools in Round 1 to 174 schools in Round 2; in contrast, the sample size for New York dropped from 480 schools in Round 1 to 263 schools in Round 2. Kaufman and Huang (1993, appendix 2) investigated the effects of the Round 2 allocation on the coefficients of variation[2] (CV) of estimates of the numbers of schools and teachers from the School Survey. The results showed appreciable gains in the precision of estimates for small states and relatively minor losses for large states.

To control the data collection by state, the fractions of elementary, secondary, and combined schools sampled in each state were constrained not to exceed about 40 percent. Subject to this constraint, minimum sample sizes of 80 elementary schools, 80 secondary schools, and 10 combined schools were targeted for each state. With these sample sizes, the CVs of state estimates for elementary and secondary schools were expected to be below 15 percent.

BIA school samples in Rounds 2 and 3. Because of the incomplete coverage of schools operated by BIA in Round 1, a separate universe of such schools was established for Rounds 2 and 3, drawn from a Program Education Directory maintained by BIA. As a first step, the BIA list was matched against the CCD public school universe to identify the BIA schools on the CCD; for analytic purposes, such schools were considered as BIA schools. The Round 2 BIA list contained 180 schools, of which 152 schools (about 85 percent) were not found on the CCD. BIA schools were placed in separate BIA strata by school level and state. Within each stratum, these schools were sorted by whether the school was operated by the BIA or by a tribe, and by school enrollment, and a sample of 101 schools was selected. BIA schools were selected within

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[2] The coefficient of variation (CV) is the ratio of the standard error of an estimate to the mean of the estimate.

Table 2-2.—Sample allocation and percent of public schools sampled in the School Survey, by state: Rounds 1-3

State	Allocated sample size[1]			Percent of schools sampled[2]	
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)	Round 2 (1990-91)	Round 3 (1993-94)
Total public schools	9,331	9,336	9,333	11	12
Alabama	174	230	221	18	18
Alaska	100	161	196	36	40
Arizona	122	170	170	17	18
Arkansas	137	160	164	15	15
California	655	370	416	5	6
Colorado	139	179	173	13	13
Connecticut	128	170	170	18	18
Delaware	72	72	72	44	42
District of Columbia	72	74	72	40	40
Florida	275	277	258	12	11
Georgia	202	192	179	11	10
Hawaii	74	92	94	40	40
Idaho	103	158	166	28	29
Illinois	357	241	283	6	7
Indiana	190	200	184	10	10
Iowa	163	174	169	11	11
Kansas	146	161	161	11	11
Kentucky	154	180	167	13	12
Louisiana	187	229	225	15	16
Maine	105	145	152	20	21
Maryland	152	178	171	15	14
Massachusetts	196	175	229	10	13
Michigan	304	211	227	6	7
Minnesota	177	189	171	12	11
Mississippi	136	235	199	25	21
Missouri	198	202	178	10	9
Montana	106	163	161	21	20
Nebraska	124	164	170	11	12
Nevada	95	114	119	36	33
New Hampshire	91	118	120	27	30
New Jersey	243	198	194	9	9
New Mexico	103	150	142	23	25
New York	480	263	313	7	8
North Carolina	203	170	184	9	10
North Dakota	100	180	162	27	29
Ohio	360	203	196	5	5
Oklahoma	179	165	161	9	13
Oregon	132	168	170	14	14
Pennsylvania	338	251	196	8	6
Rhode Island	80	108	106	36	35
South Carolina	146	186	164	17	15
South Dakota	100	167	164	21	26
Tennessee	94	205	189	13	13
Texas	262	414	413	7	7
Utah	75	174	170	24	25
Vermont	74	105	108	32	32
Virginia	107	202	188	11	10
Washington	88	176	197	10	11
West Virginia	85	170	178	16	19
Wisconsin	98	166	170	8	9
Wyoming	70	131	131	32	32

[1]Round 1 used a QED frame for sampling. Round 2 used a CCD frame with schools grouped by QED school definition. Round 3 used a CCD frame and sampled schools as listed on the frame.

[2]Percent not available for Round 1.

SOURCES: NCES (1991a); Gruber, Rohr, and Fondelier (1993, 1996).

each stratum with probabilities proportionate to the square roots of school enrollments (see Kaufman and Huang, 1993).

In Round 3 the list from BIA's Program Education Directory included 176 schools, 150 of which were not found on the CCD list frame. All BIA schools were included in the sample with certainty (Abramson et al., 1996).

Native American school samples in Rounds 2 and 3. For analytic purposes, Native American Schools are defined as public schools with 25 percent or more American Indian, Aleut, or Eskimo (AIAE) student population. For sampling purposes, the criteria used to assign schools to the Native American strata were different for Rounds 2 and 3. For Round 2 the Native American strata consisted of schools with 25 percent or more AIAE student populations as recorded on the 1988-89 CCD. In Alaska, since almost all schools met this criterion, they were sampled under the state allocation without separate stratification. For all other states, schools that met the Native American sampling criterion for this round were placed into one of four Native American strata: Arizona, North Dakota, Oklahoma, and all other states (except Alaska). The stratum sample sizes were made proportionate to the numbers of schools in the strata. Within each stratum schools were sampled with probability proportionate to the square root of the number of teachers as reported on the frame. A total of 251 schools were selected for Round 2.

Round 3 used a different cutoff for assigning schools into the Native American strata for sampling purposes. Instead of 25 percent, schools assigned were those with 19.5 percent or more of AIAE student populations as recorded on the 1991-92 CCD. The percent was lowered for sampling purpose to broaden the selection criteria, although the analyses continued to be limited to schools in which 25 percent or more of the students were AIAE students. Eight Native American strata were used: California, Montana, New Mexico, Washington, Arizona, North Dakota, Oklahoma, and all other states (again with the exception of Alaska). The sample size (excluding Alaska) was 451 schools.

2.4.2 Private school samples

Since these is no complete list of private schools, the private school sample for the School Survey is selected using a dual frame approach. The approach involves constructing and sampling from a private school list frame and supplementing that sample with an area sample of schools omitted from the list. This section briefly summarizes the construction of the list frame, the area frame, and the selection of the private school samples from these frames in Rounds 1 to 3.

List frame. The private school list frame for Round 1 (1987-88) was created using the 1986 QED file supplemented with lists of schools from 17 national private school association groups. The QED list is a list of private schools compiled annually from handbooks, directories, and other materials that list private schools. Lists of schools from the association groups were matched with the QED list, and schools not found on the QED list were added to the frame. After removing duplicates and out-of-scope schools (e.g., schools that teach only prekindergarten and kindergarten students), the SASS Round 1 private school list frame consisted of 22,600 schools from the QED file and 1,586 schools added from association lists.

Round 2 (1990-91) used the list frame developed for the 1989 PSS that was based on the 1988-89 QED private school list supplemented by schools not included in that source but found on lists supplied by 20 private school associations in the spring of 1990. The Round 2 list frame contained 20,600 schools. Round 3 (1993-94) used the 1991-92 PSS list frame updated with association lists. The Round 3 list frame contained 24,767 schools. The increase in the number of schools on the list frame between Rounds 2 and 3 is accounted for by improvements in the PSS list frame.

The PSS is an NCES survey that includes all private schools on a list frame, supplemented by an area sample of unlisted private schools. Since the 1989-90 school year, this survey has been administered every 2 years, in 1991-92, 1993-94, 1995-96, 1997-98, and 1999-00 (see Broughman, Gerald, Bynum, and Stoner, 1994; Broughman, 1996; and Broughman and Colaciello, 1998 and 1999). The PSS target population is all private schools in the United States that meet the criteria of a private school described in section 2.2. The list frame is constructed from a list of private schools initially developed for the 1989-90 PSS and updated at each subsequent administration by matching it with lists provided by nationwide private school associations, state departments of education, and other national guides and sources that list private schools. The use of state lists of private schools since the 1991-92 PSS has improved the coverage of the PSS list frame appreciably (see below).

The area frame component of the private school sample is based on a listing of private schools compiled in a sample of geographical areas for the PSS. The country is divided into a set of primary sampling units (PSUs) that are composed of single counties, combinations of contiguous counties, or independent cities. A sample of these PSUs is selected for the PSS, and a listing operation is conducted in the sampled PSUs. The resultant list is matched with the list frame, and all private schools not found on the list frame are retained for the area frame component of the private school survey. SASS uses the PSS area frame for its sampling; it does not conduct its own independent listing operation. Round 1 was an exception, because of the age of the 1983 PSS, SASS did not use the PSS area frame schools. Instead an independent field operation was conducted in order to update the area frame schools.

Table 2-3 shows the PSS year for which the area frame was developed, the number of PSUs sampled, and the SASS round in which that area frame was used. The Round 1 SASS used the same PSU area sample as the 1983 PSS. The area sample for the 1983 PSS consisted of 75 PSUs selected out of 2,497 PSUs, each with a population of at least 10,000 people according to the 1980 Population Census. Eight PSUs with a population greater than 1,700,000 were included with certainty. The remaining noncertainty PSUs were selected by systematic sampling with probability proportionate to the square root of the 1980 PSU population from 16 strata defined by having above or below median student enrollment by census region by metro/non-metro status classes. At least three PSUs were selected from each stratum.

The source of the Round 2 area frame was the 1989-90 PSS. The area sample for the 1989-90 PSS consisted of 123 PSUs. To attain approximately a 50 percent overlap with the 1983 PSS, the sample included the 8 certainty PSUs, 52 overlap PSUs sampled with equal probability from the 67 noncertainty PSUs from the 1983 PSS, and 64 PSUs selected independently. The

Table 2-3.—Allocation of the area samples for the School Survey: Rounds 1-3

SASS rounds	PSS	Area (PSU) sample sizes: Total PSUs	Certainty PSUs	Noncertainty PSUs, overlap sample	Noncertainty PSUs, independent sample
Round 1 (1987-88)	1983	75	8	0	67
Round 2 (1990-91)	1989-90	123*	8	52	64
Round 3 (1993-94)	1991-92	123*	8	58	58

*One PSU was selected in both the overlap and the independent components. An adjustment was made in the sampling weight to reflect the duplicate selection.

SOURCES: NCES (1991a); Gruber, Rohr, and Fondelier (1993, 1996).

independent sample was selected from a frame of 2,054 PSUs with a population of at least 20,000 people according to the population projections for 1988. It was a systematic sample selected with probabilities proportionate to the square root of the population projections for 1988 from each of the 16 strata defined above. A minimum of 2 new sample PSUs was allocated to each of the 16 strata, and the remaining 32 sample PSUs were allocated to the 16 strata to approximate a uniform sampling fraction for selecting PSUs in each stratum. One PSU was sampled in both the overlap and the independent components, resulting in a final sample of 123 PSUs. Weighting adjustments were used in the analysis to compensate for the duplicate selection.

Round 3 used the 1991-92 PSS area sample that consisted of 123 PSUs: 8 certainty PSUs as before, 58 PSUs that were in the PSS for the first time in 1990-91, and 58 PSUs selected independently. The sample overlap with the 1989-90 PSS was kept at about 50 percent. The independent sample of PSUs was selected using the same frame, measure of size, and sampling method as the 1989-90 PSS. One PSU was again sampled in both the overlap and the independent components resulting in a final sample of 123 PSUs for Round 3.

Area frame construction. Within each PSU sampled for the PSS, regional staff of the U.S. Census Bureau constructed lists of private schools from the following sources: telephone book yellow pages, non-Roman Catholic religious institutions, LEAs, chambers of commerce, and local government offices. The 1983 PSS also used lists from commercial milk companies and commercial real estate offices. Roman Catholic religious institutions were not contacted because the list frames provided good coverage of these schools. An area canvas (a block-by-block listing of all private schools) was not attempted in these operations.

For SASS, schools on the lists constructed in the sampled areas are matched with the schools on the updated list frame for those areas. Schools not found on the list frame were contacted by

telephone and retained in the area frame if they were found to be in-scope for SASS. The area frame consisted of 996 schools in Round 1, 900 schools in Round 2, and 355 schools in Round 3.

Table 2-4 summarizes the private school frame and sample sizes for the list and area frames for Rounds 1 to 3. The total frame count is the sum of schools in the list frame and a weighted estimate from the area sample of the number of schools not in the list frame. The high Round 1 total frame count may be due to some erroneous inclusions since this was the first SASS private school frame. The number of private schools estimated from Rounds 2 and 3 are comparable at about 26,000 schools. The area component accounted for about 24 percent of all private schools in the United States in Round 1, 21 percent in Round 2, and dropped to 5 percent in Round 3 because of improvements in the list frame.

Table 2-4.—Sample sizes for private schools in the School Survey, by type of frame: Rounds 1-3

Private school frames and samples	Round 1 (1987-88)		Round 2 (1990-91)		Round 3 (1993-94)	
	Number	Percent	Number	Percent	Number	Percent
Total frame size	31,848	100	25,998	100	26,093	100
List frame	24,186	76	20,600	79	24,767	95
Area frame (weighted estimate)	7,661	24	5,398	21	1,326	5
Total sample size	3,513	100	3,270	100	3,360	100
List sample	2,968	85	2,670	82	3,202	95
Area sample	551	15	600	18	158	5

SOURCES: NCES (1991a); Gruber, Rohr, and Fondelier (1993, 1996)

The *private school samples* were selected independently from the list and the area frames. The sample sizes from the two frames are shown in table 2-4. The sampling fractions for the list and area frames were comparable, at least for Rounds 2 and 3.

List samples. To select the list sample for each round, schools were allocated to strata. Round 1 used strata defined by state, association group, and school level. If an association group had less than 100 schools, then all schools in the association group were included in the sample with certainty. The remainder of the private school sample was allocated proportional to the number of schools in the association group. Within a state and school-level stratum, a raking procedure was used to distribute the private school allocation to the association groups. Kaufman (1991, table 5) provides the numbers of schools in the private school list frame by association group and school-level strata. A systematic sample of schools was selected from each stratum with probability proportionate to the square root of the QED number of teachers in the school. Schools with a measure of size exceeding the sampling interval were included in the sample with certainty. The procedure to control for sample overlap with other NCES surveys was built into this part of the selection process (Kaufman, 1991).

For Rounds 2 and 3, strata were defined by association group, school level, and census region. Within each stratum, schools were sorted by state and several other variables within state (e.g., highest grade, urbanicity, ZIP Code, and student enrollment). A specified number of schools was selected from each stratum systematically with probability proportionate to the square root of the number of teachers as reported in the frame (see Kaufman and Huang, 1993, for Round 2; and Abramson et al., 1996, for Round 3). All schools whose measures of size exceeded the sampling interval for the stratum were selected with certainty. For the remaining schools, the controls on overlap between rounds of the SASS School Survey were built into this part of the selection process.

Private school association groups. Table 2-5 shows the sample allocation of the private schools from the list frame by association group for Rounds 1 to 3. Round 1 included 13 association groups, and Rounds 2 and 3 included 18 and 19 groups respectively. All schools in association groups with fewer than 100 schools were included; the association groups involved included the Association of Military Colleges and Schools, Friends Council on Education, Solomon Schechter Day Schools, and some Lutheran Church schools. For other association groups, the minimum sample size was about 100 schools. Some association groups were sampled at relatively high rates. For example, 88 percent of schools from the National Independent Private School Association were sampled in Round 3.

Area samples. The area samples in each round included nearly all unlisted schools in selected PSUs. In most states in Round 1, all area frame schools were included in the sample. In six states (California, Florida, Illinois, Montana, Nevada, and Texas) schools were sampled to avoid area sample sizes exceeding 30 percent of the state's total allocation.

The Round 2 area sample included all 453 schools found in noncertainty PSUs and a sample of 147 schools selected from the 447 schools found in certainty PSUs. The 447 schools were stratified by level and then sorted by association group, enrollment, and alphabetical order of school name, and the 147 schools were selected with probabilities proportionate to the square root of the reported number of teachers. There were no controls for overlap with the Round 1 sample schools. The Round 3 area sample included all 158 schools listed in the noncertainty PSUs. The 197 schools listed in certainty PSUs were added to the PSS list frame before SASS sampling.

Design effects. The complex sampling design of SASS produces sampling variances different from those produced by a simple random sample of the same sample size. The impact of the complex design on the reliability of a sample estimate, relative to a simple random sample, can be measured by the design effect (deff). In general, this measure reflects increases in the variance arising from the clustering and departures from an equal probability sample and decreases from the use of stratification and the estimation procedures. In the case of the school survey, since there is no clustering, the measure reflects only the other factors. A deff larger than 1 indicates that the sampling error is higher than that from a simple random sample of the same size.

Salvucci, Weng, and Kaufman (1995) and Salvucci, Holt, Moonesinghe, and Kaufman (1995) computed deffs for groups of statistics by characteristics for the School, the School Principal, the

Table 2-5.—Sample allocation of private schools from the list sample and percent of schools sampled, by school association group: Rounds 1-3

Association group	Sample size			Percent of schools sampled		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total sample from list frame	2,968	2,670	3,202	9	10	12
Association of Military Colleges and Schools	26	20	33	100	100	100
Friends Council on Education	63	67	85	100	100	100
National Catholic Education Association, and Jesuit Secondary Education Association	781	716	930	9	8	11
National Association of Episcopal Schools	120	98	100	42	33	27
National Society of Hebrew Day Schools	142	101	121	25	68	47
Solomon Schechter Day Schools		55	57		100	100
Other Jewish		100	100		35	24
Lutheran Church—Missouri Synod	222	100	100	13	10	9
Evangelical Lutheran Church—Wisconsin		100	99		35	26
Evangelical Lutheran Church in America		93	100		100	84
Other Lutheran		98	60		51	100
General Conference of Seventh-day Adventists	195	103	102	15	9	9
Christian Schools International	118	101	133	46	35	14
American Association of Christian Schools International	177	99	113	17	11	12
National Association of Private Schools for Exceptional Children	110	100	177	72	54	63
American Montessori Society Schools, other Montessori schools	121	103	101	41	25	15
National Association of Independent Schools	172	218	269	18	26	30
National Independent Private School Association	‡	‡	100	‡	‡	89
Other private schools	721	398	422	9	7	5

‡Not applicable. (Not listed as a separate association group.)

SOURCES: NCES (1991a); Gruber, Rohr, and Fondelier (1993, 1996).

Teacher Demand and Shortage Survey, and the Teacher Survey in Round 2. Table 2-6 shows average deffs for the School Survey by sector for groups of national estimates relating to student totals (e.g., number of students enrollment in first grade), teacher totals (e.g., number of full-time teachers), student averages (e.g., average number of ungraded students), teacher averages (e.g., average number of Hispanic teachers), and school proportions (e.g., proportion of schools offering kindergarten).

The average deffs in table 2-6 all exceed 1, indicating that the survey estimates are less precise than the estimates that would have been obtained from a simple random sample of the same size. This loss of precision for national estimates occurs because of the compromises made in designing the school sample to meet the sample's multiple objectives, in particular the disproportionate allocation of the sample across domains to produce domain estimates of adequate precision, and the use of the square root of the number of teachers as a measure of size for sampling schools in order to also satisfy the needs of the Teacher Survey.

Table 2-6.—Average design effects for selected estimates: Round 2

Sector	Average design effect (deff)*				
	Numbers		Averages		Proportion
	Students	Teachers	Students	Teachers	Schools
Public schools	1.79	1.48	1.58	1.41	1.74
Private schools	1.11	1.27	1.18	1.19	2.05
Number of estimates	34	28	34	28	13

*Design effects were not available for Rounds 1 and 3.
SOURCE: Salvucci et al. (1995).

2.4.3 Coverage issues and frame accuracy

Two quality-related features of a sampling frame are its coverage properties for the survey's target population and the accuracy of information it provides for individual units. This section summarizes the results of several evaluation studies of these issues.

Omissions. For Round 1, the QED was found to have excluded 275 small LEAs in Nebraska with schools in elementary grades only. The missing LEAs contained only 2,800 students. Since these LEAs were excluded from the QED, they were not represented in the SASS estimates, and the schools associated with these LEAs also were not represented in the SASS school sample for Round 1 (see Hammer and Gerald, 1991, p. 22).

Erroneous inclusions. At each round some sampled schools were found to be out of scope for the School Survey (e.g., schools that did not hire teachers). Such schools were dropped from the samples, thus resulting in slightly smaller sample sizes than planned. For example, in Round 1 some schools that did not hire teachers were left in the QED frame in Louisiana, Arizona, and Virginia. In Round 2, the sample losses due to out-of-scope cases comprised 4 percent of the public school sample, 6 percent of the private school sample, and 1 percent of the BIA school sample. The sample losses in Round 3 were similar at about 3 percent for the public school sample and 8 percent for the private school sample (Monaco, Salvucci, Zhang, Hu, and Gruber, 1998, table 6.2.2).

School definition problems: Some problems occurred in all three rounds of the School Survey when the listing of schools on the CCD, QED, and PSS did not conform to the definition of schools used in SASS. In Round 2, for example, special education programs in California were found to have been listed on the CCD as a single school entity; in fact, SASS treats each location offering a special education program as a separate school. Thus, the Los Angeles special education program was listed on the CCD as one school but actually consisted of 115 separate locations, 74 of which were at regular schools already included separately on the CCD and an additional 41 locations that did not appear at all on the CCD. This same problem also occurred in Illinois and Pennsylvania. Once identified, lists of sites for the multisite programs were obtained and matched against the CCD (or other files), and a sample of those not in schools

already included on the CCD (or other files) was selected and included in the survey (Kaufman and Huang, 1993, chapter 10).

The problem also was found to have recurred in Round 3. Again, the Los Angeles special education program was listed as one school on the CCD when, in fact, the program was located in a total of 136 separate locations, of which 30 were found not to be on the CCD file. As in Round 2, a universe file of all locations for all special education programs in California was developed, compared against the CCD file, and samples selected to represent those program locations that were not in schools already included on the CCD (Abramson et al., 1996).

Frame and survey reference periods. Another factor that may affect coverage is the difference between the period for which the sampling frame was constructed and the reference period for the survey. For instance, the public school sample for Round 3 of SASS was selected from the CCD for school year 1991-92, whereas the reference period for the School Survey was school year 1993-94. Schools beginning operation after school year 1991-92 were not covered unless they resulted from a split of an existing school or a merger involving one or more existing schools. Using data from the 1993-94 CCD, it would be possible to identify schools that were in operation in school year 1993-94 but were not included in the sampling frame for Round 3 of SASS. However, this operation is complex because not all CCD schools are eligible for SASS; it has therefore not been done.

Similarly, the private school list sample frame for the Round 3 1993-94 School Survey was one that was developed for the 1991-92 PSS, so that schools that started operation after spring 1992 would normally not be included in the list frame. To partially address this problem, Round 3 updated the 1991-92 PSS for 1993-94 by using lists obtained from association groups in early 1993.

Public school district and school coverage. NCES has conducted several studies to evaluate the CCD coverage and quality (Owens and Bose, 1997; Owens and Young, 1999; Hamann, 2000; Lee, 2000). The CCD coverage of LEAs and schools are linked because, by definition, all schools on the CCD list are linked to an LEA. However, there are some LEAs with no associated schools.

At the LEA level, Owens and Bose (1997) found that the coverage of the 1994-95 CCD agency list was fairly complete for regular traditional LEAs providing elementary and secondary education. However, the coverage of nonregular LEAs that provide nontraditional services, such as charter schools and vocational-technical schools, was more problematic. This evaluation was based on comparisons of the CCD lists of agencies and schools with several other sources including: the Government Integrated Directory (GID), state education directories, the Integrated Postsecondary Education Data System (IPEDS), BIA Directory, the DOD Directory, and the 1993-94 CCD agency list. Owens and Bose found that agencies in other sources and not in the CCD list constituted about 5 percent of the total number of agencies on the CCD list. Most of the omitted agencies were found on the state education directories, and many of the omissions were found in California, Kansas, Massachusetts, Minnesota, Oklahoma, Texas, and Wisconsin. The CCD agency coverage was complete in five states (Delaware, Hawaii, Mississippi, Nebraska, and Nevada).

With regard to school coverage, the CCD public school universe does not provide universal coverage of all BIA schools. Owens and Bose (1997) found that of the BIA schools listed on the BIA Program Education Directory, only about 25 percent were covered by 1994-95 CCD. Some states listed BIA schools as private schools and reported them to the PSS (these schools were dropped from the PSS before the survey was conducted). Among schools operated by the DOD in military bases, omissions were found for two DOD agencies: the Antilles Consolidated School System in Puerto Rico and the West Point School in New York. Many DOD schools reported to the CCD by state agencies had no data reported for them. A detailed report of CCD school coverage is being prepared and should be released in 2000.

Hamann (2000) compared the coverage of 1994-95 CCD school universe file with two databases prepared by private firms: the QED and the Market Data Retrieval (MDR). This study matched the three universe files in turn to identify schools found in one source but not in the others. A draft report of this study is available and preliminary results show that the CCD file provides good coverage of regular schools.

Some insights about the coverage and quality of the CCD and QED as public school sampling frames are provided by a study conducted by Westat through the Education Statistics Services Institute (ESSI) for NCES, which evaluated the quality of these two files for the purpose of creating a sampling frame to select school samples (Lee, 2000). The study compared the QED (March 1997 edition) and the CCD (1995-96 school year) files against the 1998 NAEP public school sample. The NAEP sampling frame was based on the QED, but data on the sampled schools also incorporated the results of the NAEP field management system (FMS). The FMS collects field data from sample schools on eligibility (e.g., open or closed, regular or not regular) and data from participating schools on schools contact information (e.g., phone number and address) and school size (e.g., student enrollment). This adjusted sample was considered as the standard, against which to evaluate both the QED (the frame used to select the sample schools) and the CCD (the specifications for linking NAEP and CCD schools were provided by Dymowski, 1999). The results showed the QED somewhat more up-to-date than the CCD in the accuracy of school contact information, and revealed a small amount of undercoverage in CCD. This may occur, in part, because of the operational differences in the availability of the two files—CCD files are annual files, whereas QED files are updated almost on a continual basis and released monthly. In terms of student enrollment, however, the CCD enrollment data provide a slightly better prediction of the field observed grade enrollment than the QED enrollment data. This evaluation is limited somewhat in that the NAEP sample covers only schools with grades 4, 8, and 12 and, further, the study could not address issues of QED undercoverage. When the two frames were compared in full, Hamann (2000) found undercoverage in both frames, and concluded that both the CCD and QED frames provide comparable coverage of regular public schools. This study, however, lacked any external verification of the existence and status of the listed schools.

SASS has used the CCD frame to select the sample of public schools beginning with Round 2; given the improvements introduced into the CCD process, along with earlier availability of the file, there would appear to be no advantage to SASS in using a QED frame.

Private school coverage. The estimated proportions of schools from the list and area frames in table 2-4 provide an indication of the completeness of coverage of the list frames. As noted earlier, in Rounds 1 and 2 the area frames accounted for more than 20 percent of the estimated total number of private schools in the combined frames (NCES 1991a, p.9; Kaufman and Huang, 1993). Data for Round 2 show that the estimated proportion of schools coming from the area frame varied substantially by association group. The area frame contribution was especially large for schools that were members of the National Association of Private Schools for Exceptional Children (35.4 percent) and the American Montessori Schools Society (31.6 percent). In contrast, the area frame accounted for less than 5 percent of schools associated with the Friends Council on Education, the Association of Military Colleges and Schools, and Christian Schools International (Kaufman and Huang, 1993, appendix 4, table 18.) The area frame contribution dropped to 5 percent in Round 3 because of improvements to the list frame.

The updating of the list frame for the 1991-92 PSS used state lists of private schools as well as association lists and other lists. About 80 percent of the schools added to the list frame during the update came from the state lists (Jackson, Frazier, King, and Schwanz, 1994). The private association lists contributed about 11 percent and other lists about 9 percent of the additions. By school characteristics, the list update had the largest impact in improving the coverage of nonsectarian schools, non-Catholic religious schools, elementary schools, and small schools.

Two studies, Jackson and Frazier (1996) and Jackson, Johnson, and Frazier (1997), examined the coverage of the 1993-94 and 1995-96 PSSs and evaluated the contribution of the list updating activity and the area search component in improving private school coverage. Using capture-recapture methodology the PSS coverage of private schools in both years was estimated to be about 98 percent. The area search activities were more expensive than the list updating activities. However, since the area sample component represented about 8 percent of the schools covered in the PSS, it is needed to provide adequate coverage of private schools.

In Round 1, the private school list frame contained duplicate listings for some schools, usually with slight differences in the name or address of the school. Those discovered prior to sample selection were removed during frame construction. Some were discovered after sample selection; these schools received a weighting adjustment to account for their increased probability of selection (NCES, 1991a, p.8). Area frame schools that were on the list frame were removed from the area frame before sampling and there were no reports of duplicates between the list and area frames being discovered after sample selection.

Two recent studies evaluated the PSS and the QED as list frames for the selection of samples of private schools. Green (2000) constructed a combined PSS and QED frame for use in the 1996 NAEP. The combined frame improved coverage over either the PSS or the QED individually. The relative gains were marginal and a combined frame was not used for subsequent NAEP samples, both because of concerns about possible undetected duplication resulting from the merger of the two lists, and because the extensive resources required to merge the files correctly appeared unjustified. A subsequent study, evaluating the 1998 PSS and QED frames suggested that the PSS was superior (see Burke, 2000), as QED showed a degree of undercoverage. Both the 1998 and 2000 NAEP samples of private schools were selected from PSS.

Classification issues. Occasionally, public schools have been included mistakenly on the private school lists received from some states. As mentioned above, some BIA schools have been reported as private schools to the PSS. These schools were removed from the PSS list in constructing the private school survey list.

In some instances, the private school frames contain incorrect information on school characteristics that were used in the sample selection process. In Round 1, for example, some private schools in the School Survey reported an association membership different from that recorded on the frame and used for sampling. Some schools reported being members of the Friends Council on Education, Association of Military Colleges and Schools, or Christian School International association groups, whereas on the frame they were listed as belonging in other groups that had been sampled at a much lower rates (all schools on the list frames for the Friends Council on Education and the Association of Military Colleges and Schools were selected with certainty). No bias was introduced into the estimates for the affected association groups, but their sampling errors were substantially increased (Kaufman and Huang, 1993, appendix 4).

Missing data on the frame. Information on the number of teachers and enrollment was sometimes lacking for schools on both the public and private list frames for each round. Because teacher counts were needed to determine selection probabilities, they were imputed for these schools. In Rounds 2 and 3, values were imputed from the previous round of SASS, when available, from the application of assumed student-teacher ratios to enrollment figures, or by using the median value for other schools in the same stratum. The use of imputed values in place of reported values is likely to result in some loss in sampling efficiencies. There is no documentation of the effects of imputation on sampling efficiencies in any round.

2.5 SURVEY CONTENT

The School Survey collects information on many aspects of elementary and secondary schools. The core component of the survey pertains to basic school characteristics, staffing patterns, programs and services, and school policies. Some examples of the data collected in the Round 3 school questionnaires include enrollment by grade level, students by race/ethnicity, number of male students, number of absent students on the most recent school day, admission requirements, type of school, number and types of staff, number of teachers by race/ethnicity, number of absent teachers, teaching vacancies, programs and services offered (magnet programs, Chapter 1 services, National School Lunch Program, remedial reading, remedial math, programs for students with disabilities, programs for gifted and talented students, day care, English as a Second Language, bilingual education, diagnostic and prescriptive services, health care services, library, prekindergarten programs, alcohol and drug use prevention programs and counseling), and for high schools, the number of 1993 graduates and the number of 1993 graduates who applied to colleges.

Survey Forms. Round 1 used two questionnaire forms, one for public schools (Form SASS-3A) and one for private schools (Forms SASS-3B). Most items were the same on the two forms, with some items specific to private schools. With the addition in Round 2 of a separate sample of BIA schools, a BIA school questionnaire (Form SASS-3C) was added for BIA schools operated outside the local public school systems. Further, since Round 2, the private school and BIA school questionnaires have incorporated items from the TDSS questionnaire that is addressed to

LEAs in relation to public sector schools administered by LEAs. Round 3 also used three separate questionnaires for public, private, and BIA schools. The Round 4 School Survey includes for the first time all charter schools in operation as of 1998-99. A fourth school questionnaire form has been added for charter schools to collect additional information on when the charter was granted and by whom, what types of regulations were waived and their importance, whether the school is new or was converted from a pre-existing school, and whether the school operates within a school district.

Changes between rounds. The *SASS Data File User's Manuals* (NCES, 1991 a, b, c, d; Gruber, Rohr, and Fondelier, 1993 and 1996) document the changes in questionnaire items in each round of the survey. Section 2.6.2 in this report summarizes the cognitive research used to improve the questionnaire and its design.

The subject content for the questionnaires used in SASS reflects user needs as determined through interactions with data user groups, technical review boards, education policy researchers, and experts in the fields of teacher training and utilization. Continued interaction with the user groups also contributed to providing insight into new data needs at each round. The various groups involved in the survey content development include the SASS Private School Users Groups; the SASS Technical Review Board; the National Academy of Sciences; the National Forum on Education Statistics; the National Education Goals Panel; the Council of Chief State School Officers; and the National Science Foundation.

In 1999-00, the Round 4 questionnaires for public, private, and BIA schools have incorporated new items on: computers (number, access to the Internet, and whether there is a computer coordinator in the school); availability of certain types of curricular options; how special education students' needs are met; changes in the school year or weekly schedule; the school's enrollment capacity and whether the school has a program for disruptive students.

2.6 DATA COLLECTION

Data collection for the School Survey is accomplished through mailout and mail-return questionnaires with telephone followup of nonrespondents. This section discusses the data collection and the associated supervision and quality assurance procedures (2.6.1); the results obtained from cognitive research and pretests for each round of the survey (2.6.2); reinterview programs to measure response variance (2.6.3); and nonresponse (2.6.4). Measurement errors detected during the data file preparation and processing stages of the survey are discussed in section 2.7. A report, *Measurement Error Studies at the NCES* (Salvucci et al., 1997), summarizes various measurement error studies conducted for SASS and other NCES surveys.

2.6.1 Data collection procedures

The School Survey is conducted by mail with telephone followup of schools that fail to return the mailed questionnaires. The questionnaires are addressed to school principals who are asked to complete and return them to the U.S. Census Bureau within 3 weeks. There are no restrictions on who should complete the questionnaires; principals who wish to do so can assign the task to someone on their staff. Since response to the SASS is voluntary, the data collection procedures include a number of features to encourage cooperation. This section summarizes the data

collection activities, the mode effects in data collection, supervision of field representatives and quality assurance, and response burden.

Data collection activities. The general pattern of activities has remained more or less the same across rounds, but in later rounds, the schedule of activities has started earlier in the school year in an attempt to improve the mail-return response rate and to allow time to complete all the SASS components in the school year (see table 2-7). The process starts with the mailing of advance letters to the sampled schools and the LEAs of sampled public schools to provide general information about the survey and to ask for cooperation. The advance letter to the schools also asked them to submit lists of their teachers, to be used in selecting teachers for the Teacher Survey. The first mailing of the school questionnaires took place in January of the school year for Rounds 1 and 2. This mailing was moved forward to December of the school year for Round 3 and to September for Round 4. A postcard reminder sent 1 week after the first mailing was introduced in Round 3 and was retained in Round 4. A second mailing of school questionnaires was sent a month after the first mailing to schools that had not yet responded. Finally, mail nonrespondents were followed up by telephone as described below.

Table 2-7.—Schedule of data collection activities for the School Survey: Rounds 1-4

Activities	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)	Round 4 (1999-00)
Advance letters to LEAs	Fall, 1987	September, 1990	August, 1993	August, 1999
Advance letters to schools	Fall, 1987	September, 1990	September, 1993	August, 1999
First mailing of school questionnaires	January, 1988	January, 1991	December, 1993	September, 1999
Postcard reminder	(not used)	(not used)	One week after first mailing	One week after first mailing
Second mailing of school questionnaires	February, 1988	February, 1991	January, 1994	October, 1999
Telephone followup	April-June, 1988	March-June, 1991	January-June, 1994	November, 1999-June, 2000

SOURCES: NCES (1991a); Gruber et al. (1993, 1996); NCES (1999).

Telephone followup of mail nonrespondents. Telephone followup activities for schools that had not responded to the second mailing were initiated within about 3 weeks after mailing the questionnaires. In Rounds 1 and 2, U.S. Census Bureau field representatives, working from U.S. Census Bureau regional offices in two regions and from their homes in the other regions, attempted to complete the questionnaires by telephone. They were instructed to try to reach school principals during normal working hours between 8:00 a.m. and 5:00 p.m, to offer to hold the line a few minutes while respondents checked school records, to call back, and to accept collect calls from respondents (U.S. Census Bureau, 1991b). Respondents who were unwilling to participate in telephone interviews were asked to return the mailed questionnaire.

Telephone followups of public schools in Round 3 used computer-assisted telephone interviewing (CATI) with the interviews being conducted by U.S. Census Bureau field representatives from two U.S. Census Bureau telephone centers. In this round, about 60 percent of the sample public schools received the second mailing of questionnaires. Table 2-8 shows the number and percent of sample schools requiring telephone followup and the number and percents of interviews completed. Telephone followups of private and BIA schools were conducted by field representatives completing paper copies of the questionnaires as in previous rounds. There were 41 percent of private schools and 44 percent of BIA schools that required field representative followup, and the followup successful completion rates were 67 percent and 99 percent for these two school types, respectively (Gruber et al., 1996).

Table 2-8.—Schools requiring and completing telephone interview followup, by type of school and followup interview: Round 3

	CATI followup				Non-CATI followup			
	Total		Completed		Total		Completed	
School type	Number	Percent[1]	Number	Percent[2]	Number	Percent[3]	Number	Percent[4]
Public	4,284	44	3,111	73	382	4	362	95
Private	‡	‡	‡	‡	1,385	41	932	67
BIA	‡	‡	‡	‡	71	44	70	99

‡Not applicable.
[1]Percent of sample cases in CATI followup.
[2]Percent of sample cases in CATI followup that were completed. Cases identified as noninterview and out of scope for the survey during the CATI followup are not included.
[3]Percent of sample cases in telephone followup by field representatives.
[4]Percent of sample cases in telephone followup by field representatives that were completed. Cases identified as noninterviews and out of scope for the survey during followup are not included.
NOTE: Numbers do not total because of noninterviews and out-of-scope cases and because nonresponse cases may be switched between CATI and non-CATI followup.
SOURCE: Gruber et al. (1996).

The percent of responses received by mail (mail responses as a percent of mail plus telephone responses) varied substantially among different subgroups of the school universe and by round. Parmer, Shen, and Tan (1992) report that in Round 2 mail returns accounted for 67 percent of all responses for public schools and 56 percent for private schools in the list frame. The percent of responses received by mail varied widely by state and metro status for public schools, from 48 percent for the District of Columbia to 81 percent for Delaware, and from 55 percent in large cities to 74 percent in nonmetropolitan statistical area large towns. The corresponding percent for private schools varied by school level and association group, ranging from 48 percent for combined schools to 60 percent for elementary schools, and from 31 percent for the American Association of Christian Schools to 74 percent for the Lutheran, Missouri Synod schools (see Parmer et al., 1992, tables A1-A4).

In Round 3, 56 percent of responses were received by mail for public schools and 65 percent for private schools (Monaco et al., 1998), a reverse from Round 2. Since telephone followup collected a substantial amount of data, Monaco et al. (1998) noted a concern about possible lack of compatibility of responses due to differences in the mode of data collection.

Mode effects. Thus far, there is no conclusive evidence of a mode effect since no controlled experiments have been conducted to compare the quality of mail and telephone response in SASS and to evaluate the effects of CATI for the school survey. Two studies have found some indications of differences between mail and telephone responses to the school questionnaire. In Round 1, the reinterviews with about 10 percent of the sample schools were all conducted by telephone. The mentioned responses for counts of students served by special programs, such as bilingual education, showed more evidence of "heaping" in multiples of 100 than occurred in the responses to the initial interviews. This finding suggests a hypothesis that telephone respondents are less likely to refer to records or to arrive at a carefully considered estimate than those who respond by mail (Bushery, Royce, and Kasprzyk, 1992).

In a review of information relevant to mode effects in the Round 2 School Survey, Parmer et al. (1992) found some evidence of mode differences for private schools. For example, item response rates were found to be higher with mail response. The mail response rates show great variation by affiliation group (see table 2-9). Mail response rates close to 60 percent or more were found in Lutheran, Catholic, Military, and Christian Schools International groups. Rates of 45 percent or less were found in the following groups: Jewish, Friends, and American Association of Jewish schools. However, since the study was not a controlled experiment, it could not produce conclusive results about mode effects, nor was it able to indicate which mode yielded more accurate information.

Table 2-9.—Private School Survey mail response rates, for the list frame, by association group: Round 2

Association group	Percent obtained by mail*
Total	55
Association of Military Colleges and Schools – United States	67
Catholic	63
Friends	42
Episcopal	51
National Society for Hebrew Day Schools	35
Solomon Schecter	43
Other Jewish	36
Lutheran – Missouri Synod	74
Evangelical Lutheran Church – Wisconsin Synod	66
Evangelical Lutheran Church in America	71
Other Lutheran	58
Seventh-day Adventists	57
Christian Schools International	64
American Association of Christian Schools	31
National Association of Private Schools for Exceptional Children	58
Montessori	49
National Association of Independent Schools	49
Other private schools	50

*Mail responses as a percent of mail plus telephone responses.
SOURCE: Parmer, Shen, and Tan (1992)

Supervision of field representatives and quality assurance. The field representatives who conducted the telephone interviews at each round were experienced survey interviewers who had already been trained in basic interviewing procedures and concepts (e.g., confidentiality and how to persuade reluctant respondents to participate.) They were given an instruction manual for SASS and were trained on the content and procedures for the survey by a self-study training package. The field representatives mailed their completed questionnaires to their regional offices on a flow basis, where the forms underwent review and clerical edit. For each field representative, the first two questionnaires received were reviewed for errors by regional office staff. If a total of 10 or more errors was found in the two questionnaires, the field representative was notified of the errors and given suggestions for improvement. This process was repeated for successive sets of two questionnaires until the field representative succeeded in completing a set with fewer than 10 errors (Gruber et al., 1993).

In Round 2, the U.S. Census Bureau collected the Field Representative's Edit and Performance Records (SASS Form-23) from the regional offices. A review of these forms found that most of the regional offices had not completed them correctly and one office apparently had not used them (Pasqualucci, 1991). The review also found that many of the field representatives had accumulated more than 10 errors on their first four questionnaires. The common errors were failures to follow skip patterns and failure to follow instructions to check "None" boxes rather than entering a "0" response. In an item on the public school questionnaire asking for a breakdown of enrollment by race/ethnic category, the total for all categories frequently was not equal to the total enrollment reported in a prior question. Some field representatives had entered a percent instead of a whole number for each category. With private school questionnaire items requiring decimal entries (e.g., years of instruction required for graduation by subject) and items relating to full-time equivalent (FTE) staff, some field representatives failed to record any digits to the right of the preprinted decimal points.

In 1992, the U.S. Census Bureau tested the development of a prototype automated data collection instrument for use in one or more of the SASS surveys. Schools or other units willing to use this mode would receive a diskette containing the survey questionnaire and instructions for completing it. Using their own microcomputers, they would enter their responses on the diskette and return it to the U.S. Census Bureau. There was some small-scale testing of the prototype in Round 3 with limited success. As a result, this mode of data collection was not implemented.

The Round 3 CATI interviews for public schools were conducted by interviewers at two centralized telephone interviewing facilities. The CATI interviewers were provided with an instruction manual and were trained on the survey content and procedures. The computerized program included some built-in data edits, and data collected by CATI were transferred electronically to a central site for further processing (see Gruber et al., 1996).

Length of time to complete questionnaire. To estimate response burden, the Round 2 private school questionnaire included an item about time spent in completing the questionnaire. For questionnaires returned by mail, the person who completed the questionnaire provided the answer; for questionnaires completed in followup telephone interviews, the interviewer answered the item. The median time for completion was 60 minutes, with an interquartile range of 50 minutes. For about 90 percent of schools, the questionnaire was completed in less than 2 hours

and 10 minutes, and for 1 percent, it took more than 5 hours. The item about time burden was not asked in the Round 2 public school questionnaire, which was shorter than the private school questionnaire. As mentioned above, the Round 2 private school questionnaire was modified to include items used in a separate TDSS for public schools.

Round 3 included the item about time spent in both the public and private school questionnaires. However, responses to these items were lost due to a processing error, and no new analysis of time burden was conducted for Round 3.

2.6.2 Cognitive research and pretests

Before each survey year, NCES conducts extensive cognitive research, field tests and, in Round 1, in-depth reinterviews to seek improvements in questionnaires and survey procedures. These studies identify measurement errors in the survey, test new or revised questionnaire items, and test changes in procedures for the upcoming survey. This section summarizes the pretest activities for all SASS components conducted in preparation for the next survey round. Section 2.6.3 discusses the reinterview studies conducted after each round of SASS for measuring response variance.

Round 1 pretest and in-depth reinterviews. A large-scale pretest was conducted for Round 1 of SASS in the early part of 1987. The pretest, which was carried out in 10 states, included 220 schools, and U.S. Census Bureau interviewers reinterviewed 98 of them by telephone. These reinterviews called for in-depth discussions with respondents about how they had arrived at their initial answers, and what they had included in their counts and what was excluded, a procedure not used in subsequent reinterview programs. Respondents were also asked for their recommendations for improving any of the questionnaire items.

The report of the reinterviews (Nash, n.d.) included several recommendations for improvements in specific questionnaire items, many of which were implemented. Certain other items that were found to be difficult for some schools to report were subsequently dropped from the questionnaire. The following are some examples of the recommendations: for an item on special programs, clarify the definition of bilingual education; for an item on student enrollment by grade, clarify the treatment of students enrolled under Head Start and chapter 1 programs; 38 percent of the schools did not have records available from which to answer an item asking about present activities of teachers who had left the school after the preceding school year, so the report recommended further review of nonresponse rates for this item to determine how useful the results would be.

Round 2 preparations. The Round 2 pretest reviewed problems identified in the questionnaires used in Round 1 and tested new and revised questionnaire items and forms. The major change in Round 2 was to consolidate and integrate two questionnaires for private schools. The TDSS questionnaire (SASS-Form 1B) was made a part of the private school questionnaire. Another change that affected all questionnaires was to include a list of agencies that endorse the survey. This endorsement list was displayed prominently on the front of the questionnaires. For public schools the list included: the American Association of School Administrators, the American Federation of Teachers, the National Association of Elementary/Secondary School Principals, and other national and state educational agencies. For private schools, the list included the

American Montessori Society, the National Catholic Education Association, and other private association groups.

To evaluate the benefits of the changes, questionnaires for Round 2 were mailed to 332 public school districts, 352 public schools and principals, 398 private schools and principals, 448 public school teachers, and 448 private school teachers. NCES and U.S. Census Bureau staff reviewed all the questionnaires returned during the field test to determine the kinds of errors made by respondents and to read all comments recorded on the forms. In addition, cognitive interviews were conducted in spring 1990 with the school principals of 9 public and 6 private schools, and 10 public school teachers and 10 private school teachers in the Washington, D.C., area. Trained cognitive research staff conducted the interviews, with respondents who were asked to read aloud the questions on the form and to verbalize their thoughts as they decided how to answer; where necessary, the interviewer asked questions to clarify the respondents' remarks or behavior. The interviews were tape recorded for use in subsequent analysis.

Jenkins and DeMaio (1990) summarized the results of the cognitive interviews with school principals who answered the school questionnaires and the school administrator (principal) questionnaires. These interviews identified several items asking for counts or percents that were difficult for respondents to answer. An item asking for the percent of students enrolled at the start of the previous school year who were still enrolled at the end of that year was subsequently eliminated from the final version of the public school questionnaire. Two matrix-style items on the private school questionnaire that asked for information about FTE teaching staff by grade level and subject or specialty proved to be extremely difficult for respondents. They were eliminated from the final version of that questionnaire. Other findings from the in-depth cognitive interviews led to changes in format and wording for some items.

Round 3 preparations. The Round 3 preparations for the School Survey included the field test of new procedures and questionnaires that occurred in 1991-92 and a cognitive research study of 17 school principals held in February 1992. The 1991-92 field test took samples of 390 LEAs, 420 schools, principals, and teachers in the public sector, and 480 schools, principals, and teachers in the private sector. This field test evaluated three new procedures, two of which were adopted for Round 3. One new procedure introduced in Round 3 was to print a toll-free 800 telephone number on the front of each of the SASS questionnaires. Respondents were to use this number to call for assistance in completing the questionnaires. There have been no analyses of the use of the 800 number. Another new procedure was the mailing of a reminder postcard a week after the first mailing of the questionnaire. This reminder encouraged mail return of the questionnaires and lessened the need for telephone followups. A procedure that asked for teachers' home telephone numbers that would be used to help locate teachers who failed to return the teacher questionnaire by mail was not successful in the test and was rejected (see section 5.6.2). The *SASS Data File User's Manual* for Round 3 (Gruber et al., 1996) lists the new questionnaire items tested in each questionnaire and the items selected for inclusion in the actual Round 3 questionnaires.

A set of in-depth interviews was conducted in February 1992 in 5 mid-western states. The interviews, planned for 20 principals, were completed with 17 school principals, 4 each from Oklahoma, North Dakota, South Dakota, and Nebraska, and 1 from Iowa (Gruber et al., 1996).

The particular states were chosen because they had had high pre-edit failure rates for student and teacher counts in Round 2. Three of the four schools in each state had not been in the SASS school sample previously; the fourth school was chosen because its School Survey questionnaire returned in Round 2 had been rejected at the pre-edit stage due to discrepancies between the teacher and student counts and comparable data from the CCD. Interviewing used a condensed version of the public school questionnaire that had been used in the 1991-92 field test. The purpose was to learn more about questions that had high edit failure rates in Round 2 and to provide detailed analyses of new questions that had been developed for possible inclusion in Round 3.

A detailed account of each interview is available, as well as a paper (Jenkins, 1992a) along with a memorandum (Jenkins, Ciochetto, and Davis, 1992) that summarized the main findings and provided an item-by-item description of the problems that respondents had in answering the questions. Three classes of respondent problems were identified and examples provided.

> One class of problems was respondents' misunderstanding of concepts. A concept that was confusing for several school principals was the school for which they were to report. While the name of the school was displayed on the cover page of the school questionnaire, some principals who were responsible for multiple schools in small school systems either did not notice the school label or were confused about which school to report. Among the 17 principals interviewed, eight principals found the information about the school unit ambiguous, and three principals actually reported for a school other than the one intended. Some of the errors and uncertainties resulted from the respondents' failure to give close attention to the label and instructions on the cover page of the questionnaire, from a failure to display the name of the school prominently on the cover page, and from misleading cues in some of the initial questions.
>
> Another difficult concept was the full-time versus part-time employment status of staff. When respondents were asked to give the numbers of full- and part-time employees in each of several instructional and support services categories, they had difficulty in correctly classifying employees who had jobs that by their nature could not be full time. For example, bus drivers worked part time in more than one category but full time at the school, or worked part time at the sample school but full time for the school district.
>
> A second class of problem concerned format considerations and item layout. A format issue was noted with a series of items about limited-English-proficient (LEP) students. The introduction to these items included a blank space to record the total number of LEP students and a "none" box was placed underneath it with an instruction to skip the remaining items on LEP students if there were none. Several respondents entered "0" in the answer space, did not notice the "none" box, and proceeded through several questions that did not apply to them. Failure to use "none" boxes and follow skip instructions correctly is a fairly common problem when questionnaires are self-administered.
>
> A similar issue of item layout was found with an item asking respondents to indicate the level of difficulty they experienced in filling vacancies in a list of fields of instruction. The respondents were either to check a box to indicate that they had no vacancies in that field or to check one of four boxes by level of difficulty. Some respondents were

uncertain how to respond for fields that were not relevant in their schools. The intent of a sub-item at the end of this item, asking for specification of subfields in the vocational-technical education category, was especially unclear to respondents.

The third class of problem related to the inefficient use of records. One item on the school questionnaire asked about enrollment by grade on October 1 of the current school year. Since public schools are required by law to submit such information annually to their school district or to their state, the intention was for respondents to use their fall official report to complete this item. Instead of retrieving the official report, some school principals went through unnecessary work to complete the item and sometimes provided erroneous numbers for a different date.

A related item asked for enrollment by race/ethnicity and listed four categories of minority groups and a fifth category of white non-Hispanic students. Many school principals reported the numbers of minority students from their records and derived the number of white non-Hispanic students by subtraction from the total enrollment on October 1 that had been reported in the preceding item. However, in some instances, the records used to obtain the data for the minority categories referred to a date other than October 1, leading to an erroneous number for white, non-Hispanic enrollment.

Gruber et al. (1996) further noted that the results of this cognitive research supported a number of assumptions that had been made previously about some of the public school reporting problems identified in earlier rounds in these states. In some small school districts, the district superintendent often acts as the principal of one or more schools and may report for the entire district because the information is readily available; further, in some of these situations, all the schools in the district are located on one campus. Some local school officials and school staff who complete the SASS forms also used different school definitions from those used by state officials who provide the information for the CCD. For example, Nebraska does not report any K-12 schools for CCD; instead such schools are separated into elementary (grades K-6) and secondary (grade 7-12). However, some schools containing grades K-12 are located in a single building and have only one principal; respondents frequently report all grades in the building as one school for SASS. In some areas of Oklahoma, researchers discovered that the term "school" refers to the entire district, while "attendance center" is used to designate what is considered a school for SASS.

The research also indicated that several of the proposed new items that asked for counts of students enrolled in specific science, math, and computer science classes were too difficult and time-consuming to answer and posed definitional problems for some of the class subject name. Several respondents said that they were unable to provide accurate responses to these items.

Round 4 preparations. Jenkins (1997) discusses the cognitive research undertaken to redesign the school questionnaires for Round 4. Changes recommended included improving the wording for some items; changing the format and overall design; printing the questionnaire on a colored background (instead of white) and using white space to highlight answer spaces; reformatting the items using a one-column, in place of a two-column, layout to display the questions and answer spaces; and using newly designed skip instructions to indicate the paths through the questionnaire. These changes were based on recent research that showed that the "look" of a

questionnaire could be equally as important to the quantity and quality of the data collected as the wording and sequencing of the questions themselves.

In preparation for Round 4, Cole et al. (1997) reviewed the range of methods used to improve the mail return rates, and their applicability to SASS. They note that SASS uses many of the recommended methods, including efforts to design user-friendly questionnaires to reduce response burden, making multiple contacts with respondents through the mailings of an advance letter, the initial questionnaire, a reminder postcard (since Round 3), and if necessary a second questionnaire, and the provision of self-addressed prepaid envelopes to facilitate return of the completed questionnaires.

2.6.3 Reinterviews and response variance

A reinterview program is included as a regular part of the SASS data collection cycle to evaluate data quality. Repeat data collections (loosely, reinterviews) are conducted with a subsample of the original respondents in order to study the consistency of the responses obtained. In the reinterview program, the original data collection procedures are repeated in order to measure the reliability of the responses (i.e., response variance), as distinct from the in-depth reinterviews, which were conducted in the pretest in Round 1 to investigate the validity of the original responses and sources of response error (see section 2.6.2). The SASS reinterview programs for Rounds 1 to 3 are discussed in three reports (Newbrough, 1989; Royce, 1994; and Bushery, Schreiner, and Sebron, 1998). In addition, Bushery, Royce, and Kasprzyk (1992) compared the response variance results for questions reinterviewed in both Rounds 1 and 2, and Conley, Fink, Saba, and Kaufman (1997) provide an overview of reinterview programs used by NCES surveys.

A reinterview study has the limitation that it is difficult to replicate the original interviews. To the extent that respondents remember and repeat their answers from the original interviews, the reinterviews may not represent independent replications of the original interviews; as a result, the reliability of response may be overestimated. On the other hand, the correct responses may have changed in the time between the interviews and reinterviews, in which case reliability will be underestimated.

Reinterview sample. The SASS reinterview program for Rounds 1, 2, and 3 has involved administering a subset of questions for a second time to a subsample of the original sample of schools, school principals, and teachers. Subsamples of library media centers and student records were added to the reinterview program in Round 3. This section describes only the reinterview program for the School Survey; the reinterview programs for the other surveys are described in later chapters.

For each round, the reinterviewed sample of schools was a random subsample of about 10 percent of the original school sample that was selected before the mailout of the main survey questionnaires. Reinterviews were undertaken for the sampled schools that completed the original questionnaires. The target was to yield approximately 1,000 completed reinterviews of schools at each round.

Table 2-10 shows the sample sizes of the reinterview school samples and the response rates per round. While the subsamples of schools were close to target for Rounds 1 and 2, Round 3 had

only 555 complete reinterviews because of a large number of ineligible cases and a poor response rate in this round. About one-third of the ineligible cases in Round 3 were due to nonresponse in the original survey; about one-half completed the original survey but were deemed ineligible for inclusion (see Bushery et al., 1998). Schools that responded in the field followup were ineligible for reinterviews because of timing and other operational considerations. The reinterview response rate was poor partly because of the requirement that the same original mode of data collection be used for the reinterview. Among schools for mail reinterview, the response rate was only 57 percent. For the CATI reinterview cases, the response rate was 74 percent.

Table 2-10.—Reinterview sample sizes and response rates: Rounds 1-3

Category	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total sampled	—	1,123	1,420
Number eligible for reinterview	1,309	1,034	899
Number completed reinterview	1,138	940	555
Response rate (percent)[1]	87	91	62

— Not available. (Data were not collected or not reported.)

[1] The response rate was computed using the number of completed reinterviews divided by the number eligible for reinterview.

SOURCES: Bushery, Royce, and Kasprzyk (1992); Bushery, Schreiber, and Sebron (1998).

Reinterview procedure. The Round 1 reinterviews for schools were all conducted by telephone, using a questionnaire with selected questions from both the school and the school administrator questionnaires. The reinterview procedure was changed in Round 2 to better replicate the original survey. Thus mail reinterviews were used for mail respondents, and telephone reinterviews for telephone respondents, except that when necessary, telephone reinterviews were used for mail reinterview cases that failed to respond by mail. The respondent who answered the original school questionnaire was asked to complete the Round 2 reinterview questions. Round 3 again asked the respondent to the original survey to complete the reinterview and used a strict match of mode for the reinterviews. Nonrespondents to the mail reinterview were not followed up for telephone reinterview. Of the Round 3 reinterviews, 80 percent were completed by the respondent to the original survey, 13 percent were completed by a different respondent, and in 7 percent of the reinterviews the name of the reinterview respondent was unknown.

Reinterview questionnaires that were mailed were typically sent approximately 1 week after receipt of the original mail questionnaires. Allowing for time en route, most mail respondents received the reinterview questionnaires within 3 to 4 weeks after completing the original interview. The telephone reinterviews were typically conducted within 1 to 2 weeks after the original interviews.

Measures of response variance. Two indices have been used in the analysis of the SASS reinterview program to measure the degree of inconsistency in responses between the original survey and the reinterviews:

- The gross difference rate is the percent of respondents whose responses in the original interview and the reinterview were different.

- The index of inconsistency measures the percent of total variance for an item that is accounted for by response variance. For items with more than two response categories, the L-fold index of inconsistency is used; it is a weighted average of the simple index over all categories.

Groves (1989) and Forsman and Schreiner (1991) provide further discussion of these measures of response variance. As a rough guideline, response variance is considered to be low when the simple or L-fold index of inconsistency is less than 20 percent, moderate when it is between 20 and 50 percent, and high when it is greater than 50 percent. The gross difference rate is more difficult to interpret than the index of inconsistency. A large gross difference rate indicates high response variance in the data, but a small rate is no guarantee of good consistency. In a low-frequency response category, even a small gross difference rate can represent high response variance relative to total variance (Bushery et al., 1998).

The above indices have been computed in the SASS reinterview program assuming a simple random sample of schools. This ignores the unequal selection probabilities and the complex sample design used to draw the original school sample from which the reinterview sample was drawn. Therefore, these indices may not perfectly reflect the incidence of response error in the target population of schools.

Items evaluated at each round. The items included in the reinterview program were items expected to have high response variance. For Round 1, the items included four questions on the topics of bilingual education, English as a second language, extended daycare, and the community where the school was located.

Round 2 evaluated more items, including revised versions of the four questions used in the Round 1 reinterviews (revised after the Round 1 evaluation) and new items from the following four subject categories: student and teacher populations at the school; the school type (regular, special education, vocational/technical, and alternative), the community where it was located, and the number of days in the school year; programs that the school offered and the grade levels of instruction; and teaching vacancies in the school for the year, evaluation programs for teachers, and programs to help beginning teachers.

Table 2-11 shows the indices of response variance for the four questions evaluated in both Rounds 1 and 2. There were moderate statistically significant reductions between Rounds 1 and 2 in the gross difference rates for three of the four questions and in the index of inconsistency for two of them. All four questions had indexes of inconsistency in the moderate range in Round 2. Changes in reinterview methodology may have contributed to some of the reduced response variance, but it seems likely that at least some of the improvement in Round 2 reflects the revisions made to the questions based on the Round 1 evaluation.

The Round 3 reinterview program included items on student enrollment by grade; part-time and full-time teachers and other staff by grade; student programs and services (e.g., school lunch, and

Table 2-11.—Response variance of selected items in reinterviews: Rounds 1 and 2

Selected items	Percent "yes" response (Survey interview)		Gross difference rate		Index of inconsistency	
	Round 1 (1987-88)	Round 2 (199091)	Round 1 (1987-88)	Round 2 (1990-91)	Round 1 (1987-88)	Round 2 (1990-91)
Bilingual education	15	14	[1]16	[1]12	54	45
English as a second language	32	28	[1]16	[1]14	[1]37	[1]30
Extended daycare	16	23	9	9	32	25
Community where school is located	‡	‡	[1]35	[1]30	[1,2]43	[1,2]38

[1]Not applicable.

[1]Statistically significant difference between Round 1 and Round 2 (at a 10 percent significance level).

[2]Values from the L-fold index of inconsistency.

SOURCES: Bushery, Royce, and Kasprzyk (1992).

vocational-technical programs); and school policies on drug, alcohol, and tobacco use prevention programs.

Table 2-12 summarizes the evaluation results for the reinterview programs in Rounds 1 to 3. The index of inconsistency was calculated for items with adequate valid responses for reliable calculation (at least 50 cases with valid responses). The results cannot be validly compared across rounds because different sets of items were included in different rounds. For Round 3 over one-half of the items evaluated (70 out of 122) had indices of inconsistency below 20 percent.

Table 2-12.—Number of school survey reinterview items by index of inconsistency: Rounds 1-3

Index of inconsistency	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total questions	14	36	122
Low (0-19%)	0	17	70
Moderate (20-50%)	6	12	42
High (51-100%)	8	7	10

SOURCES: Bushery, Royce, and Kasprzyk (1992); Bushery, Shreiner, and Sebron (1998).

Effects of mode change in reinterviews. Bushery et al. (1992) and Royce (1994) examined the impact of mode for the original interviews and reinterviews for Round 2 and found that the mail-mail mode (mail return of questionnaires in both survey and reinterview) showed lower response variance than the telephone-telephone interview mode. Bushery et al. (1992) suggest that this finding may have resulted primarily from two factors:

- Only respondents who answered the original survey by mail were eligible for the mail reinterview. These respondents were likely to be more cooperative and answer the questions more carefully; and

- Respondents interviewed by mail may take time to look up the answers to questions from records or they may go through a more careful, lengthy thought process to provide the needed facts. Respondents interviewed by telephone may not feel free to take the time to look up records while the interviewer is waiting on the phone.

Another possible explanation is that some mail respondents saved copies of their questionnaires and used the copies to complete their mail reinterview questionnaires. However, a school-by-school comparison of individual responses showed that no more than 6 percent of schools would have done this.

2.6.4 Nonresponse

The School Survey is subject to total school (or unit) and item nonresponse:

- School nonresponse occurs when a questionnaire of acceptable quality is not obtained from an eligible school; and

- Item nonresponse occurs when entries are missing for one or more items on a questionnaire.

At this time, there is no direct evidence on the magnitude of biases caused by these two kinds of nonresponse. However, information about the levels of school nonresponse for different subgroups of the survey population and the levels of item nonresponse for different questionnaire items provides some indication of the potential for nonresponse bias (Smith, Moonesinghe, and Gruber, 1993; Scheuren et al., 1996; Monaco, Salvucci, Zhang, Hu, and Gruber, 1998).

School nonresponse. For public schools, a few LEAs in Rounds 1 and 2 of SASS have refused participation completely, that is, they declined to complete the LEA questionnaire for the TDSS and they specifically requested NCES not to ask schools in their district to participate. In Round 1, 35 school districts with 63 sample schools initially refused to have their schools participate in SASS. After contacts by U.S. Census Bureau representatives, 17 of these districts with 24 sample schools reconsidered their positions and agreed to allow the U.S. Census Bureau to mail questionnaires to individual schools in their districts (Nash, 1988). Thus, the ultimate loss of schools at this stage was less than 0.5 percent of the public school sample. Although only a few schools and school districts were lost at this stage in Rounds 1 and 2, a few large districts were lost in each round, with adverse consequences for the quality of the data for the states in which those districts were located. For Round 3, refusals from LEAs were rare and the loss of schools at this stage was close to none.

Weighted school response rates. Table 2-13 shows the weighted response rates for sample schools that were eligible for the school survey. The weighted response rate is the ratio of the sum of the basic weights for eligible responding schools to the sum of the basic weights for all sampled schools that are eligible for the survey, where a school's basic weight is the inverse of its selection probability. A response rate, weighted by the basic weight, provides a better indicator of the potential effect that nonresponse could have on survey estimates than does an unweighted rate.

Table 2-13.—Weighted response rates for the School Survey, by sector: Rounds 1-3

School sector	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	88	92	90
Public	92	95	92
BIA	‡	96	99
Private	79	84	83

‡Not applicable
*Basic weight is used to reflect the probability of selection.
SOURCES: NCES (1991a); Gruber et al. (1993, 1996).

The overall school weighted response rate was 88 percent in Round 1, 92 percent in Round 2, and 90 percent in Round 3. Private schools had response rates that were around 10 percent lower than public schools in all three rounds. BIA schools had relatively high response rates.

Table 2-14 shows the weighted response rates for public schools by state for Rounds 1 to 3. In Round 1, 27 states had weighted response rates close to 95 percent or better and 3 states (District of Columbia, Hawaii, and Maryland) had rates below 80 percent. In Round 2, 37 states had rates close to 95 percent or better and none had rates below 80 percent. The overall response rate fell slightly from Round 2 to Round 3, and only 13 states had rates of 95 percent or better. Maryland had the lowest response rate in both Rounds 2 and 3 (81 and 85 percent, respectively).

For private schools, table 2-15 shows the weighted response rates by list and area frames and by association group and school type. For each round, the response rate of schools from the area sample was much lower (around 70 percent) than that of schools from the list sample. The response rates also varied among schools from the various association groups and across rounds within association groups. At least in part this is a reflection of the small samples on which many of the rates are based (see table 2-5).

Analytic studies were conducted for Rounds 2 and 3 to examine variations in response rates for different categories of school. Some results are displayed in table 2-16. The study by Scheuren et al. (1996), which investigated variations in response rates for the first four characteristics in the table for Round 2, used a Bonferroni multiple comparison test with a 10 percent significance level for each characteristic (Ahmed, 1991). In the table S denotes a significant difference in response rates between at least one pair of categories for the characteristic; NS denotes no significant differences. Some significant category differences were found by region, school size, and urbanicity for public, and by school level and school size for private schools. However, as the table shows, the response rate differences are not great, particularly in the case of public schools.

Table 2-14.—Weighted response rates for public schools in the School Survey, by state: Rounds 1-3

State	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	92	95	92
Alabama	97	96	95
Alaska	97	92	88
Arizona	97	95	92
Arkansas	95	98	94
California	88	95	88
Colorado	99	96	92
Connecticut	89	93	93
Delaware	91	93	88
District of Columbia	68	86	86
Florida	98	94	95
Georgia	95	97	94
Hawaii	78	99	92
Idaho	98	99	92
Illinois	95	99	94
Indiana	97	100	94
Iowa	96	97	96
Kansas	93	98	93
Kentucky	90	98	92
Louisiana	89	94	90
Maine	97	95	92
Maryland	75	81	85
Massachusetts	95	91	94
Michigan	98	97	97
Minnesota	91	97	95
Mississippi	97	97	94
Missouri	85	98	95
Montana	95	98	92
Nebraska	96	99	89
Nevada	96	96	88
New Hampshire	97	96	98
New Jersey	92	88	87
New Mexico	88	96	93
New York	85	88	89
North Carolina	91	93	90
North Dakota	100	98	96
Ohio	95	97	93
Oklahoma	90	96	95
Oregon	97	95	93
Pennsylvania	87	96	89
Rhode Island	99	97	90
South Carolina	88	97	87
South Dakota	95	99	96
Tennessee	92	98	95
Texas	87	97	94
Utah	100	98	98
Vermont	99	99	93
Virginia	90	92	89
Washington	100	93	96
West Virginia	94	98	93
Wisconsin	94	95	94
Wyoming	94	98	95

*Basic weight is used to reflect the probability of selection.

SOURCES: NCES (1991a); Gruber et al. (1993, 1996).

Table 2-15.—Weighted response rates for private schools in the School Survey, by association group and school type: Rounds 1-3

Association group	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	79	84	83
Schools from area sample	67	74	71
Schools from list sample	—	87	84
List sample by association group:			
Association of Military Colleges and Schools	86	91	96
Friends Council on Education	83	91	80
National Catholic Education Association, Jesuit Secondary Education Association	90	91	89
National Association of Episcopal Schools	82	89	78
National Society of Hebrew Day Schools	72	71	79
Solomon Schechter Day Schools		85	88
Other Jewish		70	72
Lutheran Church—Missouri Synod	90	96	91
Evangelical Lutheran Church—Wisconsin Synod		98	90
Evangelical Lutheran Church in America		96	95
Other Lutheran		94	88
General Council of Seventh-day Adventists	89	94	89
Christian Schools International	95	94	69
American Association of Christian Schools International	56	59	73
National Association of Private Schools for Exceptional Children	84	87	89
American Montessori Society Schools, other Montessori schools	82	86	83
National Association of Independent Schools	74	85	82
National Independent Private School Association	‡	‡	80
Other private schools	71	81	79
List sample by school type:			
Catholic	—	91	89
Parochial	—	90	88
Diocesan	—	92	91
Private order	—	94	88
Other religions	—	80	76
Conservative Christian	—	74	77
Affiliated	—	88	77
Unaffiliated	—	77	80
Nonsectarian	—	82	86
Regular	—	77	86
Special emphasis	—	83	81
Special education	—	92	93

—Not available
‡Not applicable. (Not listed as a separate association group.)
*Basic weight is used to reflect the probability of selection.

SOURCES: NCES (1991a); Gruber et al. (1993, 1996); McLaughlin and Boughman (1997); McLaughlin, O'Donnell, Ries, and Boughman (1995)

Table 2-16.—Weighted response rates for public and private schools in the School Survey, by selected characteristics: Rounds 2 and 3

Characteristics	Weighted response rate (percent)[1]			
	Round 2 (1990-91)		Round 3 (1993-94)	
	Public	Private	Public	Private
Region:				
West	95	84	91	78
South	95	80	92	82
Northeast	92	85	90	82
Midwest	98	86	94	89
	S[2]	NS[3]	P=0.003	P<0.001
Urbanicity:				
Central city	93	83	90	83
Urban fringe/large town	94	87	91	84
Rural	98	82	94	84
	S[2]	NS[3]	P<0.001	P=0.747
School level:				
Combined	94	76	90	75
Secondary	96	90	93	87
Elementary	95	88	92	87
	NS[3]	S[1]	P=0.010	P<0.001
School size:				
1-149	97	81	95	81
150-499	96	88	93	86
500-749	95	80	92	85
750+	93	87	89	83
	S[2]	S[2]	P<0.001	P=0.011
School type:				
Nonregular	‡	‡	90	‡
Regular	‡	‡	92	‡
			P=0.072	
Minority enrollment:				
<5.5%	‡	‡	94	‡
5.5-20.5%	‡	‡	92	‡
20.5-50.5%	‡	‡	91	‡
>50.5%	‡	‡	90	‡
			P=0.004	
School sampled with certainty:				
Yes	‡	‡	92	‡
No	‡	‡	92	‡
			P=0.514	
School sampled in 1990-91:				
Yes	‡	‡	93	88
No	‡	‡	92	62
			P=0.606	P<0.001
Submitted a teacher list:				
Yes	‡	‡	93	‡
No	‡	‡	61	‡
			P<0.001	
1991-92 PSS status:				
Respondent	‡	‡	‡	85
Nonrespondent	‡	‡	‡	44
Not in 1991-92 PSS	‡	‡	‡	63
				P<0.001

‡Not applicable.
[1]Basic weight is used to reflect the probability of selection.
[2]S indicates a significant difference between the response rates for at least some of the levels of the variable at the 10 percent significance level.
[3]NS indicates that none of the differences are significant at that level.

SOURCES: Scheuren et al. (1996); Monaco et al. (1998).

Monaco et al. (1998) performed similar analyses for the 1993-94 Round, including the four characteristics examined in the 1990-91 study and adding the characteristics displayed in the lower part of table 2-16 (some of which related only to public schools, others only to private schools). They used an overall test of differences across categories; the significance level reached is indicated by the *P*-value in the table. For the four characteristics common to both analyses, the patterns of response rates are similar across rounds: response rates are highest in the Midwest, lowest for combined schools, and highest for small public schools and public schools in rural areas. Two of the new variables exhibited marked differences in response rate by category: public schools that submitted the teacher listing form had a substantially higher response rate (93 percent) than schools that did not (61 percent); and private schools that responded to the 1991-92 PSS had a much higher response rate (85 percent) than those that did not (44 percent).

Both studies extended their analyses to develop logistic regression models predicting response rates using the characteristics studied as explanatory variables. Details are presented in the reports.

Item nonresponse. Table 2-17 shows the data from published summaries of unweighted item response rates for the School Survey for the first three rounds (NCES, 1991a; Gruber, et al., 1993 and 1996.) The rates refer to the status of each item after edits but prior to imputation, and the base for each rate is the number of questionnaires for which the item should have been answered.

Table 2-17.—Percent of items with selected response rates for the School Survey, by sector: Rounds 1-3

Sector and round	Percent of items with response rates:		Minimum of item response rates (percent)
	≥ 90 percent	< 75 percent	
Round 1 (1987-88)			
Public	64	11	43
Private	56	8	11
Round 2 (1990-91)			
Public	77	1	56
Private	77	5	67
BIA	87	4	60
Round 3 (1993-94)			
Public	83	0	83
Private	77	3	61
BIA	84	1	70

SOURCES: NCES (1991a); Gruber et al. (1993, 1996).

Item response rates tended to be lower for items requiring respondents to report numerical amounts than for those requiring a choice among two or more categories. A common problem in Rounds 1 and 2 was a failure to check boxes for "none" when that was called for. Item nonresponse problems in Round 1 and, subsequently, in Round 2 led to several changes in the content and format of the questionnaire. Because of these and other changes, the results for the three rounds shown in table 2-17 are not directly comparable.

One item that caused particular problems in Round 1, for both public and private schools, was an item on staffing patterns that appeared in the form of a 3 x 28 grid. The 3 columns asked for number of teachers as on October 1, 1986; number of those no longer teaching on October 1, 1987; and number of teachers in the category on October 1, 1987. In the 28 rows, teachers were to be classified by 27 different primary fields of assignment, with a total in the final row. This item appeared to be difficult for respondents to complete, as indicated by a combination of missing and inconsistent entries. NCES decided that the quality of data from this item was unacceptable and did not include the data in either its public or restricted use microdata files for the School Survey. In the Round 2 School Survey, some parts of this item were dropped; other parts were retained but were asked in a different format.

Other items with high item nonresponse rates in Round 1 for both sectors included an item on availability of instruction and size of enrollment in "grades 13 and 14" (covering vocational and other "postgraduate" secondary education) and an item asking for a breakdown of prior year staff roles of teachers who were no longer in the profession in the current year. In Round 2, the grades 13 and 14 categories for enrollment were replaced by a single "postsecondary" category. The other item was retained but the number of separate response categories was substantially reduced.

In Round 2, items with response rates below 75 percent included those relating to counts of part-time staff and to degree of difficulty in filling vacancies in selected categories. Problems with the items on part-time staff are attributed partly to the format of the item, which covered both full and part-time staff, and partly to respondents' uncertainty about the definition of "part time," especially in the smaller schools.

In Round 3, none of the items on the public school questionnaire had response rates below 75 percent. For the private school questionnaire, the block of items (item 31c) that had response rates below this level asked about teacher vacancies. The items asked whether there were vacancies for the school year, and, if so, about the methods used to cover them and about the difficulty or ease of filling vacancies in each of the 14 fields.

2.7 DATA PROCESSING AND ESTIMATION

This section summarizes the sequence of processing operations for the School Survey that occurred between the receipt of questionnaires in the U.S. Census Bureau's processing facility in Jeffersonville, Indiana, and the production of a clean data file of schools. The processing units at Jeffersonville handled the activities with large clerical elements and transmitted the data files electronically to U.S. Census Bureau's headquarters in Suitland, Maryland, which handled most of the computerized operations. The activities discussed in this section include clerical review of questionnaires and data entry operations (2.7.1); computer edits and file preparation (2.7.2);

imputation of missing data (2.7.3); construction of weights (2.7.4); and methods of variance estimation with SASS data.

2.7.1 Clerical review and data entry of hard-copy questionnaires

Upon receipt of the hard-copy questionnaires, clerks at Jeffersonville assigned codes to each questionnaire to indicate its interview status (e.g., complete interview, noninterview, or out of scope). Then they performed a general clerical edit that included reviewing all entries for legibility and consistency (e.g., changing "one" to "1" and rounding fractions to integers). For CATI questionnaires, these edits were built into the data collection programs.

After clerical review edits, the questionnaires were sorted by school type (public, private, and BIA) and by interview status. The specification for data entry called for 100 percent independent verification of all data keyed from the questionnaires. All errors identified during the keying operation were corrected, with problem cases referred to supervisors.

Error resolution. Attempts were made to resolve some critical errors identified during clerical edit and also the following computer pre-edit operations (see section 2.7.2) by recontacting respondents by telephone. In Rounds 2 and 3, telephone callbacks were used, in particular, to resolve large differences between reported enrollments and teacher counts and the expected values of these items based on the CCD file used for sampling schools. In Round 1, many discrepancies of this kind were detected only when these items were compared at the aggregate level after data processing was completed (see section 2.8.1), and their resolution at that stage caused significant delays in the production of clean data files. Starting with Round 2, the CCD values for these items were included on the mailing labels for the school questionnaires, so that large discrepancies (differences of over 35 percent) could be detected and resolved by the clerical reviews. Any discrepancies not resolved were flagged for resolution during computer pre-edit.

Checks for invalid entries for specific items, inconsistencies between items and other problems were included in both the computer pre-edit and edit operations. In the pre-edit, a listing of rejected schools and items was produced and sent to Jeffersonville, where the clerical staff reviewed the listings in conjunction with the questionnaires and, as needed, recontacted respondents. In the edit, problems detected in the corrected data files were resolved through programmed instructions to blank or impute problem items; there were no attempts to contact respondents at this stage. Some questionnaires were rejected in the edit and the schools were treated as nonrespondents if values were still missing or out of range for selected key items. Round 1 used fairly stringent criteria in pre-edit check and extensive followup to collect data from schools on key items. The pre-edit criteria was relaxed for subsequent rounds and there were less extensive followup with schools. This change of procedure may affect the percent of schools treated as nonrespondents at this stage.

Field office edit in Round 2. A field office edit check on the quality of the data collected by field representatives during the telephone followup operations was conducted in Round 2. Part of this edit required the clerk to compare the numbers of students and teachers reported in the school questionnaire with the numbers of students and teachers from the CCD shown on the label for that questionnaire. If the CCD count was twice (or half) the number reported on the

questionnaire, the field representative was required to provide a written explanation of the difference.

2.7.2 Computer edits and file preparation

The computer pre-edit was designed to identify inconsistencies and invalid entries for key data items. This pre-edit step generated a list of cases with problems and displayed the items rejected by the pre-edit program along with the error messages describing the problems. The listings of rejected schools and items were reviewed in conjunction with the questionnaires, and, as needed, respondents were recontacted by telephone to clarify their responses. Entries confirmed to be correct were checked for acceptability; those that were erroneous but could not be corrected were deleted; and corrections made were marked on both the rejection list and the original questionnaire.

Gruber et al. (1996, table VII-2) list the reasons for pre-edit rejections for public school data and the number of records rejected as a result of these edits. School records were rejected when there were large discrepancies between data on the frame and data reported by schools. For example, over 900 records were rejected because the numbers of teachers reported by the schools were different from the frame numbers by 25 percent or more. A small number of schools were rejected because they reported no teachers or no students and, thus, were ineligible for the School Survey. The vast majority of the problem cases were found in Montana, New Jersey, North Dakota, South Dakota, Wyoming, and the District of Columbia. The corrections made at this stage were incorporated into the data files.

Computer edits consisted of the following components: a range edit with out-of-range entries being deleted; a consistency edit with inconsistent entries either being made consistent or deleted; and a blanking edit with inappropriate entries being deleted and entries that were blank but should have been answered being assigned a "not answered" code. To some extent, the computer editing repeated a number of the checks performed at the pre-edit stage, such as checking for invalid entries or inconsistencies. However, all errors detected at this later stage were resolved through programmed instructions, without further reference to either the respondent or the questionnaire.

This stage of editing checked for inconsistencies both within and between items and made use of available information to fill incomplete or omitted responses. For example, in Round 3, if a school's total enrollment was not reported in item 8 of a public school record but enrollment by grade was reported in item 7, the omitted response in item 8 was replaced by the sum of the enrollments from item 7. Gruber et al. (1996, figures VII-5-7) give the number of changes made to each item in the Round 3 public, private, and BIA school questionnaires. Most school records had some edit changes made at this stage.

Edit rejection rates. School records with missing or out-of-range data for selected key items after editing were rejected and treated as noninterviewed schools. The rules for determining a school's final response status (i.e., interviewed, noninterviewed, or out of scope) after computer edits are described in the *SASS Data File User's Manual* (Gruber et al., 1993 and 1996). In Round 3, for example, the change from interviewed to noninterviewed status affected less than 1

percent of schools that had initial interviewed status (300 public schools, 30 private schools, and 1 BIA school).

Assignment of locale codes in Round 2. Round 1 reinterviews (see section 2.6.3) and cognitive interviews using Round 2 pretest questionnaires showed that responses to the question, "Which best describes the community in which the school is located?" had moderate response variance. The same question was used in Round 2, but a separate locale or "urbanicity" code was developed by matching each school's mailing address to U.S. Census Bureau geographic files containing population density data, standard metropolitan statistical area codes, and urban/rural codes. The same locale codes were used for the school and school administrator data files. These more rigorously defined locale codes will sometimes differ from the codes based on self-reports of community type (Kaufman and Huang, 1993, section 1.4.4; Johnson, 1993).

2.7.3 Imputation

Imputation is the procedure of assigning values for questionnaire items that should have been answered but were not or for which the answers were deleted in editing. Several alternative imputation methods are used in SASS: some make use of available data reported for the same school on the school questionnaire; some make use of data from other SASS components such as the School Principal Survey and the TDSS for public schools; and, if necessary, some assign valid values from a donor school with similar characteristics. Imputation is used to compensate for item nonresponse among interviewed schools. Weighting adjustment procedures (see section 2.7.4) are used to compensate for noninterviewed schools.

The *SASS Data File User's Manuals* for Rounds 2 and 3 (Gruber et al., 1993, 1996) provide details on the imputation rates and methods, and additional details about item-by-item specifications for imputation are available in SASS Specifications Memoranda covering each survey and each questionnaire. For Round 3, Gruber et al. (1996, figures VIII-14 to 22) document the imputation method for each item on the public and private school questionnaires. This section summarizes the extent of imputation and the three basic stages of imputation employed for the School Survey.

Extent of imputation. All items on the School Survey questionnaires were imputed at each round. In Round 1 there were two items on the private school questionnaire that were not imputed initially, an item on place of operation and an item concerning staffing patterns. These items were imputed later when the Round 1 data was released with data from Rounds 2 and 3 on a CD-ROM (NCES, 1998).

At several stages during data processing, some respondents' or interviewers' initial entries on the questionnaires were changed or deleted, or values (including 0) were supplied for items initially left blank on the questionnaire. Except when these changes were the result of followup contacts with respondents, the process of changing entries or of assigning values for deleted entries was part of imputation.

Some imputation was done during the computer editing and a very limited amount in earlier stages of processing, including the initial clerical edit and the clerical resolution of pre-edit rejections. Most changes during the clerical operations resulted from followup contacts with

respondents; clerical imputation was permitted only in a few situations where the correct entry was obvious from other information on the questionnaire. Table 2-17 provides an indication of the levels of item nonresponse after corrections had been made at the pre-edit stage.

Imputation methods. Most of the imputation for each round of the School Survey was done in a computerized imputation operation conducted in stages as follows:

- *Stage 1 deductive imputation.* Stage 1 imputation replaces the missing or inconsistent values with values that could be derived with a reasonable degree of assurance from other available data for the same school. The data for the same school were extracted from one of the following sources: other items on the school's questionnaire, items from other SASS components that pertained to the same school, and information from the sampling frame.

  The imputation for Round 3 also involved the use of ratio adjustments to correct for some inconsistencies between items. For example, if the total of the numbers of students by race/ethnicity did not equal the total enrollment reported elsewhere in the questionnaire, the numbers of students by race/ethnicity were adjusted by applying the proportion of students in each race/ethnicity group to the total number of enrolled students, thus making the detailed numbers consistent with the total. The same procedure was used to adjust any discrepancies between the total teacher count, the numbers of teachers by race/ethnicity, and the numbers of teachers by part-time and full-time status. The adjustments were applied to both public and private schools.

- *Stage 2 hot deck imputation.* Data that remained missing after the stage 1 imputation were processed in the stage 2 sequential hot deck imputation procedure. This procedure sorted schools into imputation classes that contained schools with similar characteristics. The value assigned for a missing item for one school was then the value for that item in another school (the donor) in the same imputation class. The variables used to define imputation classes included metropolitan status, percent minority enrollment, and size of enrollment (see NCES, 1992; Gruber et al., 1993, 1996). The choice of imputation classes was based on analyses of response propensities and characteristics of respondents and nonrespondents. Hot deck imputations were sometimes used on a transformed variable. For example, if a school reported that it had a remedial reading program but did not report the number of students served by the program, the school's total enrollment would be multiplied by the proportion of enrollment served in remedial reading programs at another school with similar characteristics (Kaufman and Huang, 1993, section 8.2).

- *Stage 3 clerical imputation.* Round 3 included a clerical imputation step for items not completely imputed by the first two stages. This method involved reviewing the data record, the sample file record and, in some cases, the school questionnaire before deriving an entry consistent with the information from the various sources. This procedure was used on 12 items in the public school questionnaire and 13 items in the private school questionnaire. It was used in situations when there was no suitable record to use as a donor for hot deck imputation, when the computer imputation method produced an imputed entry that was outside the acceptable range for an item, or when there were very few cases where an item was unanswered (usually less than 10).

Imputation of items on the BIA school questionnaire was done clerically in both Rounds 2 and Round 3 because of the small number of BIA schools and the relatively low level of item nonresponse. The BIA school records were sorted by state and size so that records for similar schools were close together. The questionnaires were reviewed for notes and other entries that were useful in deciding the entries to be imputed. If an item could not be completed based on the information on the questionnaire, entries from the record for a similar school were used. Gruber et al. (1996, figure VIII-23) give the imputation method and the percent of entries imputed by the method for each BIA questionnaire item.

2.7.4 Weights

The weighting procedures used in the School Survey have three purposes: to take account of the school's selection probabilities; to reduce biases that may result from unit nonresponse; and to make use of available information from external sources to improve the precision of sample estimates.

The weighting procedures for public, private, and BIA are quite similar, with minor variations at some stages. For each sector in Rounds 1 and 2, the overall weights are the product of the following four factors: a basic weight, a sampling adjustment factor, a school nonresponse adjustment factor, and a first-stage adjustment factor to known frame totals. In Round 3, a fifth factor—a second-stage ratio adjustment factor—is added for private schools.

Basic weight. This is the inverse of the selection probability for the school. Schools selected with certainty have a basic weight of 1.

Sampling adjustment factor. This factor is used to take account of special circumstances that affected a school's probability of selection. The circumstances included frame duplications not discovered prior to sample selection, including the special case where a sample school was discovered to have merged with another one also included in the frame. Another instance is the one described earlier, in which some special education programs, with operations at several locations, were identified in the frame as single schools. In this situation, locations not already included in the frame as regular schools were subsampled.

School nonresponse adjustment factor. This factor is applied to the interviewed schools for which acceptable questionnaires were obtained to compensate for sample losses due to noninterviewed schools. The factors, which are calculated separately for specified adjustment cells, are the ratios of the summed sampling weights (product of the first two factors above) for all eligible sample schools in the cell to the summed weights for those that responded.

The nonresponse adjustment cells used by type of school for the three rounds of the School Survey were the following:

- For public schools, the cells were defined in sequential order by state, grade level (elementary, secondary, or combined), urbanicity, and enrollment size class.
- For BIA schools, the cells were defined by grade level, and in the case of elementary schools they are further defined by enrollment size.

- For Native American schools, the cells were defined by grade level, state strata, and in the case of elementary schools also by enrollment size.

- For private schools, the Round 1 adjustment cells were defined by census region, affiliation (Catholic, other religious, and nonsectarian), grade level, and urbanicity for schools on the list frame; and census region, affiliation (same broad classes), and grade level for schools on the area frame. The Round 2 and Round 3 cells for schools on the list frame were based on the association groups in the estimation domain (18 groups in Round 2 and 19 groups in Round 3), grade level, and urbanicity (for Catholic and other private school groups only). The cells for schools on the area frame were based on affiliation (3 broad groups), grade level, and enrollment size class.

Cells with small samples (less than 15 public and private schools or less than 10 BIA or Native American schools), and cells with high adjustment factor values (1.5 or larger for public or private schools, or 2.0 or larger for BIA or Native American schools), were combined following designated rules (Gruber et al., 1993, 1996).

The nonresponse adjustment factors are based on the assumption that the probability of nonresponse may vary between cells but does not vary among individual schools within cells. Therefore, it is important to define the cells in a way that makes nonresponse probabilities as homogeneous as possible within cells. Shen, Parmer, and Tan. (1992) examined the correlates of nonresponse in Round 2 School Survey samples of public and private list sample schools, using a variety of analytic procedures. Their analyses supported the use of the Round 2 adjustment cells for public schools but suggested a change in the order of collapsing cells when collapsing is necessary. For the private school list frame, they suggested the use of enrollment size in creating adjustment cells, in addition to the variables used in Round 1, as well as a change in the order of collapsing cells. Their suggestions were adopted in part for the Round 3 School Survey, as indicated above.

First-stage ratio adjustment factor. This adjustment is used to adjust for differences between expected and actual sample sizes. Like the nonresponse adjustment factors, these ratio adjustment factors are calculated separately for specified adjustment cells. The factor for each cell is the ratio of the total number of schools in the frame in that cell to the sample estimate of that number, based on all schools selected, without regard to their final response and eligibility status. Schools that turned out to be ineligible or did not respond had to be included in the denominator in order that the weighted sample total would conform to frame totals.

For public schools and private schools in the list sample, the cell definitions and collapsing rules were similar, although not always identical, to those used for the nonresponse adjustments. For the private school area sample, the frame ratio adjustment factors use weighted area frame PSU totals as the control totals. For Round 2 this adjustment was applied only in the certainty PSUs since all schools in the area frame were included in the sample for the noncertainty PSUs. For Round 3, adjustment was not applied to the private schools in the area sample since, as described in section 2.4.2, the area frame schools in certainty PSUs were incorporated into the list frame and those in noncertainty PSUs were sampled with certainty.

Second-stage ratio adjustment factor for private schools in Round 3. Round 3 added a second-stage ratio adjustment factor to the private school sampling weights to adjust the SASS sample estimates to more up-to-date independent control counts from the 1994 PSS. Since Round 3 of SASS and the 1993-94 PSS were fielded in the same school year, there were up-to-data school counts to support this adjustment. Adjustment factors are derived using the ratio of the weighted 1993-94 PSS estimates of schools to the weighted 1993-94 SASS sample estimate of schools within adjustment cells. This adjustment has the advantage of reducing sampling variability and maintaining better consistency with the PSS. Since this adjustment was not used in previous rounds, this change needs to be taken into account when examining trends across rounds.

Analogous adjustments for public schools to up-to-date CCD counts have yielded unsatisfactory results due to definitional and other differences between CCD and SASS. Therefore, a second-stage ratio adjustment was not applied for public schools (Abramson et al., 1996). Scheuren and Li (1995, 1996) and Holt, Kaufman, Scheuren, and Smith (1994) have explored the use of modified generalized least squares methods to derive the sampling weights in order to achieve consistency between SASS and PSS estimates of schools, teachers, and students. However, this approach did not provide a satisfactory solution for attaining consistency on all three counts.

2.7.5 Variance estimation

Balanced half-sample replication. In Rounds 1 and 2, the balanced half-sample replication method is used to estimate the sampling errors associated with estimates for all surveys in SASS. Replicates are subsamples of the full sample. For the balanced half-sample procedure, each replicate or subsample consists of approximately one-half of the full sample of schools. Each sample school is included in one-half of the replicates, except for schools selected with certainty which are included in all replicates. The statistic of interest, such as the number of students at a specified grade level, is estimated from each replicate. Then, the mean square error of the replicate estimates around the full sample estimate provides an estimate of the variance of the statistic.

A total of 48 replicates was designated for each of the SASS surveys in both rounds. For the School Survey, special procedures were used to ensure that the effect of controlling overlap of the Round 1 and Round 2 samples would be properly reflected in estimates of variance for changes occurring between the two rounds. In Round 1, the same overall nonresponse and frame ratio adjustment factors were used for each replicate. In Round 2, these factors were calculated separately for each replicate. Details on the procedures for designating the replicates are provided in the *Data File User's Manuals* (NCES, 1991a; Gruber et al., 1993) and the *Sample Design and Estimation Report* for these two rounds (Kaufman, 1991; Kaufman and Huang, 1993).

Each public use data file contains 48 sets of replicate weights needed to produce balanced half-sample replicated variance estimates, so that file users can estimate the sampling errors for statistics that are of interest to them. The same procedures are used to estimate the sampling errors that are presented in all SASS publications (e.g., Education Data Tabulations by Bobbitt, Broughman, and Gruber, 1995).

Bootstrap replication. Round 3 used a bootstrap method to create the 48 replicate samples in place of the balanced half-sample method, with the bootstrap replicate samples being selected without replacement. For private schools from the area frame, the balanced half-sample method was again used to create the replicate weights in the same way as previous rounds. Variance estimation in Round 3 can be performed with the same variance software packages used to perform the balanced half-sample method.

A concern with the balanced half-sample replication method is that it treats the schools as sampled with replacement and hence ignores the finite population connection (fpc) factor. Since the School Survey employs high sampling fractions in a number of domains—particularly small states and association groups—ignoring the fpc's in variance estimation will lead to overestimates of the variances for some estimates. The bootstrap replication method is designed to avoid this overestimation (Kaufman, 1992,1993,1994).

Broene and Rust (2000) compare three software packages for estimating standard errors in NCES surveys, including SASS, two of which employ a linearization approach and the third employs a replication approach. They point out that since the replicate weights developed for the School Survey and other SASS surveys have been constructed in Round 3 with the aim of accounting for the fpc's, standard errors computed by replication methods should avoid overestimation. The linearization packages, when used without the inclusion of fpcs, tend to overestimate standard errors in SASS surveys.

Table 2-18 shows, for public schools, estimates of the number of schools, teachers, and students by state from Round 3 of the School Survey, together with the CVs of those estimates (where the CV is the standard error of the estimate divided by the estimate). A commonly used standard for acceptable precision is that a CV should be less than 10 percent. All the CVs in table 2-18 are much lower: for the number of schools, Nebraska has the highest CV at 3.6 percent; for the numbers of teachers and students, the CVs are somewhat larger, but only one exceeds 6 percent (a CV of 6.8 percent for the number of students in Nebraska).

Table 2-19 shows the corresponding estimates for private schools in Round 3 of the School Survey. The CVs vary markedly across the different types of private schools in the table, from under 1 percent to just over 10 percent (for the numbers of teachers and students in nonsectarian special emphasis schools). The majority of the estimates have CVs of less than 7 percent.

Generalized variance functions and design effects. Generalized variance functions (GVFs) provide a simple means for obtaining approximate sampling errors associated with survey estimates. They are useful for analysts who do not work with microdata files or lack the software for computing sampling errors for complex sample designs. Salvucci and Holt (1992) confirmed the feasibility of including GVFs in SASS publications. Specific parameter values for the GVFs have been computed for Round 1 by Salvucci, Holt, and Moonesinghe (1994), and have been used in internal analyses at NCES. The parameter values for the GVFs and the design effects of estimates were again computed for Round 2 (Salvucci, Weng and Kaufman, 1995). These estimates have not been updated for Round 3.

Table 2-18.—Number of public schools, teachers, and students, and coefficients of variation (CV), by state: Round 3

State	Number of schools	CV (percent)	Number of teachers	CV (percent)	Number of students	CV (percent)
Total	80,740	0.2	2,561,2944	0.8	41,621,660	0.9
Alabama	1,274	1.0	44,791	3.5	745,963	3.5
Alaska	478	1.2	8,152	4.7	127,130	4.8
Arizona	1,057	0.8	37,600	3.2	685,519	3.1
Arkansas	1,084	0.8	30,621	3.1	460,286	4.1
California	7,319	1.0	209,032	3.6	4,804,574	3.6
Colorado	1,329	1.1	35,723	5.2	616,434	4.9
Connecticut	964	1.0	35,465	2.9	472,718	2.6
Delaware	169	1.2	7,027	3.8	107,701	3.7
District of Columbia	160	2.8	5,185	3.3	75,948	3.9
Florida	2,348	1.2	106,535	3.0	1,888,762	3.1
Georgia	1,723	0.6	74,907	1.9	1,194,072	2.1
Hawaii	234	0.5	11,137	4.1	173,041	4.7
Idaho	573	1.0	12,166	4.4	218,179	4.6
Illinois	3,884	1.6	111,511	2.5	1,747,678	2.6
Indiana	1,869	0.4	57,32	2.8	972,991	2.8
Iowa	1,518	1.3	35,861	4.1	484,443	4.1
Kansas	1,450	0.6	31,164	3.9	431,981	4.5
Kentucky	1,327	2.1	41,571	4.0	693,316	4.3
Louisiana	1,446	0.5	48,948	2.2	791,318	2.3
Maine	721	1.0	15,658	4.3	207,975	4.7
Maryland	1,185	0.6	43,362	1.6	753,706	1.6
Massachusetts	1,689	1.1	58,416	2.8	776,415	2.8
Michigan	3,159	1.2	83,288	4.0	1,491,699	4.3
Minnesota	1,492	2.1	44,150	4.6	705,021	5.1
Mississippi	957	0.8	29,851	3.9	531,874	3.8
Missouri	2,082	0.5	62,454	3.6	938,836	4.2
Montana	890	0.6	12,851	4.6	175,611	5.3
Nebraska	1,296	3.6	20,411	5.5	248,016	6.8
Nevada	365	1.6	12,822	3.4	231,088	3.3
New Hampshire	445	0.0	12,299	5.9	174,563	6.1
New Jersey	2,195	1.4	83,935	4.0	1,097,841	5.0
New Mexico	663	0.5	19,265	3.9	323,001	4.0
New York	3,904	0.7	178,701	3.4	2,593,562	3.7
North Carolina	1,927	1.5	72,305	3.8	1,090,802	3.8
North Dakota	582	1.8	8,404	5.3	115,635	6.0
Ohio	3,636	1.7	111,518	3.2	1,816,266	3.4
Oklahoma	1,763	1.0	42,220	3.5	579,583	4.0
Oregon	1,184	0.6	25,706	3.6	478,877	4.4
Pennsylvania	3,128	1.4	114,571	5.3	1,805,243	5.6
Rhode Island	295	2.4	9,217	5.9	124,230	4.9
South Carolina	1,081	0.9	39,623	4.4	630,309	5.0
South Dakota	661	2.0	10,579	4.3	139,525	5.3
Tennessee	1,522	0.7	47,662	3.0	840,505	3.8
Texas	5,890	0.9	223,800	4.0	3,342,778	4.4
Utah	674	1.6	19,884	3.4	454,114	3.6
Vermont	318	2.2	7,327	4.8	91,787	5.1
Virginia	1,698	2.4	64,937	4.9	958,091	4.8
Washington	1,806	0.6	48,452	3.7	913,048	3.4
West Virginia	898	3.3	21,473	5.2	316,190	5.3
Wisconsin	2,014	0.9	62,958	3.3	880,935	3.2
Wyoming	411	2.0	7,567	5.0	102,484	5.4

SOURCE: CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

Table 2-19.—Number of private schools, teachers, and students, and coefficients of variation (CV), by state: Round 3

Private school type	Number of schools	CV (percent)	Number of teachers	CV (percent)	Number of students	CV (percent)
All private schools	26,093	0	378,365	1.5	4,970,548	1.2
Catholic	8,351	0	149,840	1.0	2,516,028	0.6
Parochial	5,109	2.2	77,382	2.7	1,386,668	2.5
Diocesan	2,436	4.1	46,941	3.7	791,605	3.8
Private order	806	6.5	25,516	5.9	337,756	6.1
Other religious	12,180	1.7	140,279	2.6	1,686,069	2.9
Conservative Christian	4,664	3.8	49,676	5.5	641,828	5.5
Affiliated	3,437	4.8	52,395	4.7	580,666	4.2
Unaffiliated	4,079	6.2	38,209	6.4	463,575	7.3
Nonsectarian	5,563	3.6	88,246	4.3	768,451	4.8
Regular program	2,484	7.3	57,306	5.5	539,785	6.4
Special emphasis	1,788	7.5	15,955	11.7	141,929	10.6
Special education	1,290	9.2	14,985	8.9	86,738	8.7

SOURCE. CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

2.8 EVALUATION OF ESTIMATES

This section describes comparisons of weighted School Survey estimates with data from other sources, including other SASS surveys, the CCD, the PSS and, to a limited extent, data from other agencies and organizations. Comparisons of survey estimates with other data can be made both prior to and following publication. In Round 1, as soon as weighted data files were available, state-level estimates of numbers of schools, total enrollment, and teacher counts were compared with CCD and QED data. The large differences in estimates that were found for public schools in some states led to a substantial amount of review of individual school records and questionnaires and, in some instances, recontacts with schools in order to correct erroneous data. A similar set of operations was undertaken in Round 2, except that QED data were not used in the comparisons. The prepublication review and correction operations are referred to as the "prepublication review." Comparisons of the final estimates with data from other sources is termed the "evaluation of published estimates." The following discussion includes the prepublication review and evaluation of estimates for Round 1 (2.8.1) and Round 2 (2.8.2) and the evaluation of estimates in Round 3 (2.8.3).

2.8.1 Prepublication review and evaluation, Round 1

Total student enrollment. An initial comparison of survey estimates and CCD counts of total enrollment by state identified several states, predominantly in the Midwest, for which public

school enrollment estimated from the School Survey was much higher than expected. To identify the individual schools that might account for the differences, a list was prepared of 972 public schools whose reported enrollment exceeded the expected value, based on the QED frame, by 35 percent or more. Questionnaires for 687 of these schools (excluding those in the states with the lowest ratios of reported to expected enrollment) were subjected to detailed reviews. About one-fourth of the 687 questionnaires were accepted as correct. About one-half of them had been partially completed for the school district or for more than one school and there was enough information on the questionnaire to make corrections. For the remaining one-fourth, it appeared that all questionnaire items had been completed for a school district, two schools, or the wrong school. These cases were assigned to NCES and U.S. Census Bureau staff for telephone reinterviews, which were successfully completed for about four-fifths of them.

This experience led to the following conclusion:

> Our review of the questionnaires and phone conversations with school secretaries and principals lead us to believe that these errors were made because the respondents misread the first question on the school questionnaire, or because of their employment positions (district superintendent, assistant superintendent, principal for two schools, etc.), they assumed we wanted information for all schools under their jurisdiction rather than the school named on the questionnaire label. (Fondelier, 1989a).

Number of teachers. After the corrections based on the above review had been incorporated in the School Survey data file, further comparisons with CCD data showed that estimates of the number of public school teachers for some states were still much higher than expected, based on the CCD. Program specifications were reviewed for possible errors although none were detected.

A list of suspect schools was compiled, based on several criteria, such as student/teacher ratios, comparison of head counts and FTE counts of teachers, and comparison of FTE counts for the school and for the district in which it was located. Two of the criteria used for flagging schools were met by more than one-eighth of all sample schools.

The review of suspect schools was based primarily on examination of computer listings. There were no recontacts with schools and only a few of the original questionnaires were examined. The review led to corrections for 281 school records. The conclusion concerning sources of the problem was:

> The problem of FTE teacher overestimates was caused chiefly by the respondents' reporting district enrollment for some schools—he inconsistency between the district enrollment and the school teacher count triggered the edit procedure which increased the teacher count [which had not been subsequently returned to its original value when the enrollm nt count was corrected]. Other causes were probably poorly recorded entries which were misread by the keyers and a lack of

understanding by some respondents of "full-time equivalent". (Fondelier, 1989b).

The review found that 13.7 percent of the interviewed schools with one or more part-time teachers had identical entries for the head count and FTE number of teachers. However, no changes were made for these schools; it was believed that "... changing the FTE entries for these cases would not significantly alter the weighted teacher counts for the states in which they were located" (Fondelier, 1989b).

Round 1 evaluation of published estimates. Information obtained from prepublication reviews, comparisons with CCD data, and other sources of information within NCES leads to the following conclusions about the quality of final estimates from the School Survey in Round 1:

- School counts estimated from SASS were lower than those obtained from NCES's Public Elementary/Secondary School Universe Survey, a part of the CCD program. At the national level, CCD counts exceeded SASS estimates by 6 percent, with the differences being greatest for Nebraska—44 percent, North Dakota—42 percent, South Dakota—38 percent, and Montana—15 percent. These differences were due in part to definitional differences between the QED (frame for the Round 1 School Survey), which defines schools in terms of physical locations, and the CCD, which defines them in terms of administrative units (NCES, 1991a).

- In Nebraska, the QED was found to have excluded some small (elementary grades only) LEAs with a total of about 275 schools and 2,800 students. The schools, students, and teachers in these LEAs were not included in SASS (Hammer and Gerald, 1991, p.22).

- The FTE teacher counts from the School Survey are likely to be overestimates. In the average state, 19 percent of the schools having part-time teachers reported identical FTE and head counts for teachers (NCES, 1991a).

- FTE teacher counts for Hawaii from SASS were substantially higher than the CCD counts. For the latter, the state had reported in terms of "authorized" positions that were filled, whereas in SASS the schools correctly reported all teachers, regardless of whether their positions were officially authorized (Fondelier, 1989b).

Smith and Salvucci (1989) compared preliminary estimates of private school enrollment from the Round 1 School Survey with estimates from the October Education Supplement to the U.S. Census Bureau's Current Population Survey (CPS) and, for Catholic schools, compared SASS estimates of school counts and enrollment with data available annually from the National Catholic Educational Association (NCEA). The CPS estimate of enrollment in private elementary and secondary schools in October 1987 was 4,420,000. This estimate was 16.5 percent below the preliminary SASS estimate of 5,291,000 and 15.3 percent below the final SASS estimate of 5,218,000. CPS estimates of private school enrollment were also significantly below estimates from NCES sources other than SASS for 1983, 1985, and 1988. The report asserted that "... these differences cannot be fully explained without a major benchmarking study."

The NCEA figures for Catholic schools are based on an annual census covering all schools identifiable as Catholic, including those operated by private boards of control and not affiliated with a parish or diocese.

As shown in table 2-20, the SASS final school and enrollment estimates exceeded those of the NCEA by 5.9 and 7.6 percent, respectively. For the following school year, the estimate of Catholic school enrollment from NCES's Early Estimates Survey exceeded the NCEA's count by 9.2 percent. A subsequent review of school lists available annually from the Council for American Private Education (1992) suggested that the higher estimates from SASS may be accounted for in part by schools that are affiliated with the U.S. Catholic Conference but were not included in the NCEA annual census.

Table 2-20.—Enrollment in private Catholic schools, from the NCEA and from the School Survey: Round 1

		School Survey	
1987-88 estimate of:	NCEA	Preliminary	Final
Number of Catholic schools	8,992	9,540	9,527
Enrollment (thousands)	2,623	2,827	2,823

SOURCE: Smith and Salvucci (1989).

2.8.2 Prepublication review and evaluations of estimates, Round 2

In Round 1, the discovery at the weighting stage of discrepancies between SASS preliminary estimates and CCD counts of schools and teachers led to substantial unanticipated processing costs and significant delays in publication of the survey results. Changes were introduced in Round 2 in an attempt to eliminate or minimize the impact of such problems. The CCD replaced the QED list as the primary source of the frame for the public school sample. Instructions were added to the public school questionnaire to report data only for the school named on the label, and the expected numbers of teachers and students for each school were displayed on the label. Expected and reported school enrollment and teacher counts were compared in the field office edit operation, with followups for differences of 50 percent or more.

In spite of these changes, initial postprocessing comparisons of weighted estimates by state showed that the SASS estimates of total teachers from the public school data file were at least 15 percent greater than the state FTE teacher counts from the 1991 CCD for 9 states, and staff reviews identified significant data problems for 1 additional state. For these 10 states, approximately 375 schools with large differences between the SASS and CCD records were identified. The individual records for these schools were compared, and when appropriate, the SASS records were changed to make them consistent with the CCD data for the schools. Changes were made to about 300 of the SASS records in this group. These comparisons of records for individual schools showed that there were two main causes of the SASS overestimates of teachers: some schools reported data for all of the schools in a school district, and there were instances where 2 or more schools (as defined for CCD) at a single location were reported as a single school.

After the changes were made, the school files for the 10 states were reprocessed to produce new estimates of students and teachers. Some residual problems were identified and a few additional changes were made. As will be noted in chapter 5, for the schools for which changes had been made in the postprocessing edit, some of the teacher records also required changes. (For additional details, see chapter VII, section F of the *Data File User's Manual* for Round 2.)

Round 2 evaluation of published estimates. Final estimates of public schools by state for Round 2 of the School Survey conducted in 1990-91 were compared with school counts from the CCD for the same school year. The SASS estimate for 1 state, Oklahoma, was about 15 percent higher than the CCD count. There were differences of 5 to 10 percent for 8 states and the District of Columbia. The SASS estimates were from 5 to 10 percent higher for Arizona and Nevada and 5 to 10 percent lower for Alaska, Louisiana, Minnesota, South Dakota, Wisconsin, Wyoming, and the District of Columbia. For the remaining 42 states, the SASS estimates were within 5 percent of the CCD counts. For the United States, the SASS estimate was 97.9 percent of the CCD count for the same school year (Gruber, Rohr, and Fondelier, 1993, table XII-4).

The CCD counts may be expected to be higher mainly for two reasons. With a few exceptions, the SASS sample did not cover schools that did not exist at the time of the 1989 CCD but were reported in the 1991 CCD. Second, 4 percent of the schools sampled from the 1989 CCD were found in SASS to be ineligible for the survey because they were no longer operating, had merged with another school, or were not serving students in any of grades 1-12. A factor causing differences in the other direction was that some of the schools sampled from the 1989 CCD list were found in SASS to represent more than one school, for example, an elementary and secondary school operating at the same location but under separate administration. Although the elimination of schools that were ineligible during the reference school year and the inclusion in the sample of units with more than one school in SASS give rise to differences between SASS and CCD estimates, these factors did not cause any bias in the SASS estimates.

The SASS estimates of the numbers of private schools by school type (nine categories of schools with religious affiliations and nonsectarian schools) were compared with counts from the 1989-90 PSS, which provided the sampling frame for the sample of private schools for the Round 2 School Survey (which covered the 1990-91 school year). The SASS estimates were smaller in all nine categories. This was primarily the result of 1989-90 PSS schools that were found to be out of scope in SASS in 1990-91. As mentioned before, 5.6 percent of the sample of private schools were found to be ineligible because they were no longer operating, had fewer than 10 students, or did not meet the SASS definition of a school for other reasons. For the United States, the SASS estimate of the number of private schools came to 92.4 percent of the 1989-90 PSS count (Gruber, Rohr, and Fondelier, 1993, table XII-5).

For private schools, the Round 2 School Survey estimates of numbers of students and teachers were compared with counts from the 1989-90 PSS. The SASS student counts were 3.8 percent higher than the PSS counts and the SASS teacher counts were 1.7 percent lower. These differences may have been due in part to the sampling error associated with the SASS estimates.

The 1989-90 PSS enrollment counts for Catholic schools exceeded counts from NCEA's census for the same year by 5.4 percent of the latter's figure (Gruber, 1992a). Differences by state

showed large variations; however, some of these could be attributed to the inclusion by the NCEA in a single state of counts for archdioceses with schools in more than one state.

Data reported on the School Survey questionnaires were not always internally consistent. For example, the total of enrollment counts by grade frequently differed from the total of enrollment counts by race/ethnicity for the same school. The questionnaire item on enrollment by grade asked for counts as of October 1, whereas the item on enrollment by race/ethnicity did not specify a reference date. For schools with large discrepancies, the data for the two items were edited to make them consistent, but there were some residual differences.

2.8.3 Evaluation of estimates, Round 3

The prepublication review of Round 3 identified the need for less extensive editing than previous rounds, and comparisons of SASS estimates with estimates from other sources showed a fairly high level of agreement. These findings suggest that changes introduced into the Round 3 questionnaires and procedures were successful. The *SASS Data File User's Manual* (Gruber et al., 1996) provides a detailed account of comparisons with other sources.

Public school estimates. Gruber et al. (1996) compare Round 3 (1993-94) SASS estimates of the numbers of public schools with the numbers of public schools on the 1991-92 CCD Public School Universe file (excluding CCD schools that are out of scope for SASS, such as schools that have only prekindergarten and kindergarten levels only, schools with only basic adult education, or vocational schools with only postsecondary studies). Nationally, the SASS number for public schools was about 2 percent lower than the CCD number (see table 2-21). Only the District of Columbia and Nebraska had estimated numbers of public schools from SASS that were below 90 percent of the CCD numbers. Four states had SASS estimates of their numbers of schools between 90 and 95 percent of the CCD numbers, and there were four states in which SASS estimates were higher than the CCD numbers (all were within 1 percent of the CCD numbers). Hoffman (1995) discusses the changes in school estimates between the 1991-92 and the 1993-94 CCDs.

The estimated numbers of public school students in the Round 3 (1993-94) School Survey were compared with the estimates for the same school year from the CCD State Nonfiscal Survey (Johnson, 1995). Two comparisons were made, one to the CCD total number of students, and the CCD count of kindergarten to grade 12 students. The latter is the better comparison for SASS, since the SASS definition of students (i.e., students in kindergarten to grade 12 for schools that offer a grade 1 as well as kindergarten) excludes prekindergarten students.

Overall, the estimated SASS student count is almost 4 percent lower than CCD's total students and just over 3 percent lower than CCD's kindergarten to grade 12 student count (see table 2-22). There are slightly more than one-half a million prekindergarten students included in CCD, and excluding them brings the SASS student count into the same degree of "fit" as the SASS number of schools (a difference of about 3 percent). Excluding prekindergarten students of course enlarges the difference in those states for which the SASS estimate is higher than the full CCD count, but in most cases the SASS estimate is only about 1 to 2 percent points higher than the full count.

Table 2-21.—Public schools in SASS School Survey and in the 1991-92 Common Core of Data (CCD), by state: Round 3

State	Number of schools		SASS/CCD(percent)
	1991-92 CCD*	1993-94 SASS	
50 states and DC	82,772	80,740	98
Alabama	1,287	479	99
Alaska	490	478	98
Arizona	1,072	1,057	99
Arkansas	1,092	1,084	99
California	7,549	7,319	97
Colorado	1,350	1,329	98
Connecticut	975	964	99
Delaware	172	169	98
District of Columbia	178	160	90
Florida	2,460	2,348	95
Georgia	1,721	1,723	100
Hawaii	236	234	99
Idaho	583	573	98
Illinois	4,095	3,884	95
Indiana	1,891	1,869	99
Iowa	1,552	1,518	98
Kansas	1,458	1,450	100
Kentucky	1,384	1,327	96
Louisiana	1,445	1,446	100
Maine	730	721	99
Maryland	1,199	1,185	99
Massachusetts	1,731	1,689	98
Michigan	3,295	3,159	96
Minnesota	1,584	1,492	94
Mississippi	965	957	99
Missouri	2,081	2,082	100
Montana	900	890	99
Nebraska	1,453	1,296	89
Nevada	370	365	99
New Hampshire	445	445	100
New Jersey	2,258	2,195	97
New Mexico	672	663	99
New York	3,942	3,904	99
North Carolina	1,943	1,927	99
North Dakota	616	582	94
Ohio	3,746	3,636	97
Oklahoma	1,809	1,763	97
Oregon	1,190	1,184	100
Pennsylvania	3,235	3,128	97
Rhode Island	307	295	96
South Carolina	1,096	1,081	99
South Dakota	670	661	99
Tennessee	1,512	1,522	101
Texas	5,972	5,890	99
Utah	704	674	96
Vermont	336	318	95
Virginia	1,800	1,698	95
Washington	1,835	1,806	98
West Virginia	970	898	93
Wisconsin	1,999	2,014	101
Wyoming	417	411	99

*CCD schools that are out of scope for SASS are excluded.

SOURCE: Gruber et al. (1996).

Table 2-22.—Public school students in the School Survey and in 1993-94 Common Core of Data (CCD), by state: Round 3

State	Number of students (in thousands)			SASS/CCD (percent)	SASS/CCD less PK (percent)
	CCD 1993-94	CCD less PK	SASS		
50 states and DC	43,476	42,919	41,622	96	97
Alabama	734	726	746	102	103
Alaska	126	123	127	101	103
Arizona	709	706	686	97	97
Arkansas	444	443	460	104	104
California	5,329	5,267	4,805	90	91
Colorado	625	618	616	99	100
Connecticut	496	490	473	95	96
Delaware	106	105	108	102	103
District of Columbia	81	75	76	94	101
Florida	2,041	2,006	1,889	93	94
Georgia	1,235	1,230	1,194	97	97
Hawaii	180	180	173	96	96
Idaho	237	235	218	92	93
Illinois	1,893	1,851	1,748	92	94
Indiana	966	962	973	101	101
Iowa	499	493	484	97	98
Kansas	458	455	432	94	95
Kentucky	655	640	693	106	108
Louisiana	801	788	791	99	100
Maine	217	216	208	96	96
Maryland	773	755	754	98	100
Massachusetts	878	865	776	88	90
Michigan	1,599	1,588	1,492	93	94
Minnesota	810	804	705	87	88
Mississippi	506	504	532	105	106
Missouri	876	852	939	107	110
Montana	163	163	176	108	108
Nebraska	285	282	248	87	88
Nevada	236	235	231	98	99
New Hampshire	185	184	175	94	95
New Jersey	1,151	1,142	1,098	95	96
New Mexico	322	320	323	100	101
New York	2,734	2,702	2,594	95	96
North Carolina	1,133	1,125	1,091	96	97
North Dakota	119	119	116	97	98
Ohio	1,807	1,790	1,816	101	101
Oklahoma	604	599	580	96	97
Oregon	517	516	479	93	93
Pennsylvania	1,744	1,740	1,805	104	104
Rhode Island	146	145	124	85	86
South Carolina	644	636	630	98	99
South Dakota	143	142	140	98	98
Tennessee	867	857	841	97	98
Texas	3,608	3,488	3,343	93	96
Utah	471	469	454	96	97
Vermont	103	101	92	89	91
Virginia	1,045	1,042	958	92	92
Washington	916	911	913	100	100
West Virginia	314	310	316	101	102
Wisconsin	844	827	881	104	107
Wyoming	101	101	102	102	102

SOURCE: Gruber et al. (1996)

There are 7 states in which the SASS public school kindergarten to grade 12 student count is lower than CCD's by more than 8 percent: California, Massachusetts, Minnesota, Nebraska, Rhode Island, Vermont, and Virginia. Five states have a SASS student count that is 5 percent or higher than CCD's kindergarten to grade 12 student count: Kentucky, Mississippi, Missouri, Montana, and Wisconsin (Gruber et al., 1996).

Private school estimates. For private schools, the 1993-94 SASS School Survey estimates were compared with the 1991-92 PSS (the frame year) and the 1993-94 PSS (the survey reference year). Table 2-23 shows the results of the comparisons by private school types. For the total estimate, there is no difference between the three surveys, part of this is due to the weighting adjustment that matched the 1993-94 SASS total estimate of private schools to the 1993-94 PSS total. By type of school, there is some variation in the ratio of the SASS estimate to the PSS 1991-92 estimates. For Catholic schools, the PSS estimates are in fact larger by about 6 percent; whereas for other religious schools and nonsectarian schools, the SASS estimates are larger by 4 percent and 3 percent respectively. Relative to the 1993-94 PSS estimates, the SASS estimates are virtually the same for Catholic, other religious, and nonsectarian schools. For some school subgroups, such as Catholic private order schools, other religious affiliated schools, and nonsectarian regular program and special education schools, the SASS estimates are larger than the PSS estimates by 6 percent or more. On the other hand, for Catholic and nonsectarian special emphasis schools, the SASS estimates are smaller by 10 percent or more.

Table 2-23.—Private schools in the School Survey and in the 1991-92 and 1993-94 Private School Survey, by type: Round 3

Private school type	PSS 1991-92 number	PSS 1993-94 number	SASS 1993-94 number	SASS/ 1991-92 PSS (percent)	SASS/ 1993-94 PSS (percent)
All private schools	25,998	26,093	26,093	100	100
Catholic	8,889	8,331	8,358	94	100
Parochial	5,485	5,127	5,332	97	104
Diocesan	2,502	2,371	2,133	85	90
Private order	901	833	893	99	107
Other religious	11,760	12,222	12,232	104	100
Conservative Christian	4,291	4,530	4,524	105	100
Affiliated	3,950	3,640	3,881	98	107
Unaffiliated	3,519	4,051	3,827	108	94
Nonsectarian	5,349	5,541	5,503	103	99
Regular program	2,376	2,198	2,342	99	107
Special emphasis	1,810	2,106	1,809	100	86
Special education	1,163	1,237	1,353	116	109

SOURCE: Gruber et al. (1996)

Table 2-24 shows the comparison of estimated number of full-time equivalent teachers (FTEs) between the 1993-94 SASS and the 1993-94 PSS. The 1993-94 SASS estimate of the number of private FTE teachers is about 2.5 percent lower than the 1993-94 PSS number for all private

schools. By types of private schools, the SASS estimates fall short of the PSS estimates for Catholic schools, other religious affiliated schools, and in particular, for nonsectarian special emphasis schools; the SASS estimate is below by more than 12 percent for these types of private schools. On the other hand, the SASS estimates exceed the PSS estimates for some school types. For example, for the other religious unaffiliated schools, the SASS estimate exceeds the PSS estimate by more than 13 percent.

Table 2-24.—Number of full-time equivalent (FTE) teachers in private schools from the School Survey and the 1993-94 Private School Survey: Round 3

Private school type	Number of FTE teachers		SASS/PSS (percent)
	PSS	SASS	
All private schools	339,267	330,839	98
Catholic	143,214	132,240	92
Parochial	75,839	68,105	90
Diocesan	42,239	41,174	97
Private order	25,136	22,961	91
Other religious	117,397	120,254	102
Conservative Christian	42,178	44,841	106
Affiliated	46,511	42,839	92
Unaffiliated	28,708	32,574	113
Nonsectarian	78,655	78,345	100
Regular	48,539	49,533	102
Special emphasis	16,552	14,548	88
Special education	13,564	14,264	105

SOURCE: Gruber et al. (1996).

3. THE SCHOOL PRINCIPAL SURVEY

3.1 INTRODUCTION

The School Principal Survey (called the School Administrator Survey in the 1987-88 and 1990-91 Rounds) is the second in the series of surveys comprising the Schools and Staffing Surveys (SASS). It follows directly from the School Survey, since the school principals in the sampled schools are the School Principal Survey respondents. The School Principal Survey gathers information about principals, about school staffing and program decisions, and about administrative practices. The questionnaire collects demographic information for the principals and also information on their academic background and experience, professional training, career plans, and attitudes toward school management issues. Information collected in the School Principal Survey can be integrated with the information collected in the School Survey and the Teacher Survey to fill critical gaps in the knowledge base about schools, teachers, and students. School principals, who consist of principals, headmasters or headmistresses, were asked to complete their own questionnaires, rather than delegating all or part of the task to other staff, as was permitted for the School Survey questionnaire.

For the most part, this chapter does not repeat the design features and procedures already described in chapter 2. This chapter has sections covering the main phases of the survey: sampling frames (3.2); sample design (3.3); content (3.4); data collection procedures (3.5); data processing (3.6); measurement error (3.7); nonresponse (3.8); estimation (3.9); and evaluation of estimates (3.10).

3.2 SAMPLING FRAMES

For all three survey rounds (Round 1 in 1987-88, Round 2 in 1990-91, and Round 3 in 1993-94), the target population for the School Principal Survey consisted of the principals or head administrators of all public and private schools eligible for inclusion in the School Survey. A small number of the sampled schools, primarily those with low enrollment or in rural areas, did not have principals. Schools were identified as not having a principal if the response box for the statement "This school has no principal/school head" was checked on the first page of the School Principal Survey questionnaire for private schools or if the response box for the same statement but without the words "school head" was checked on the questionnaire for the public schools. Schools indicating the absence of a principal were dropped from the School Principal Survey. In both Rounds 1 and 3, about 1 percent of the public schools and under 5 percent of the private schools had no principal, according to published survey estimates (Choy, Medrich, Henke and Bobbitt, 1992; Henke, Choy, Geis, and Broughman, 1996). Except for such cases, the sampling frame for the School Principal Survey was the same as the school sampling frame, which is described in detail in section 2.4. Thus, the frame problems at the school level noted in section 2.4.3, such as undercoverage, duplicate schools, definitional changes, survey reference periods differing from frame reference periods, incomplete sampling information, and out-of-scope listings apply equally to school principals.

Out-of-date or incorrect contact information, which can result in nonresponse, reflects another type of frame deficiency. Fortunately, only 0.2 percent of principals in Round 1 and 0.4 percent of principals in Round 2 could not be contacted. In Round 3, only 0.1 percent of both public and

private sampled school principals could not be contacted (Monaco, Salvucci, Zhang, Hu, and Gruber, 1998). These rates are upper limits for the cases not contacted because of incorrect contact information since there are other possible reasons for noncontact, such as a principal being away from school for the entire collection period.

3.3 SAMPLE DESIGN

For all three survey rounds, once the sample of schools is selected, no additional sampling is needed to select the sample of school principals. The principals' selection probabilities are those of their schools. Thus, principals are selected, within strata, with probabilities proportionate to the square root of the numbers of teachers as reported on the sampling frame for their schools. A detailed discussion of sampling procedures for schools is provided in section 2.4.

Salvucci, Weng, and Kaufman (1995) conducted a detailed analysis of the design effects associated with the variances of a set of estimates from the School Principal Survey for Round 2. For this survey these design effects reflect increases in the variances arising from departures from an equal probability sample and decreases from the use of stratification and the estimating procedures. Large design effects indicate that sampling variability is high compared to that from a simple random sample of the same sample size.

Salvucci et al. (1995) report average design effects for a set of 34 estimates of national totals (e.g., the total number of principals with a master's degree, the total numbers reporting certain types of school problems as serious) of 1.77 for public schools and 1.95 for private schools. The average design effect for a set of 10 estimates of national proportions (e.g., the proportion of principals reporting excellent teaching staff) was 1.78 for public schools and 2.37 for private schools. The inverse of the design effect represents the multiplier to be applied to the actual sample size with the complex sample design to give the effective sample size, where the effective sample size is the size of a simple random sample that would yield an estimate of the same level of precision. Thus, a design effect of 1.77 implies that the effective sample size is only 56 percent of the actual sample size. The cause of this reduction from the actual to the effective sample size lies mainly with the unequal selection probabilities used for sampling school principals; they were sampled via their schools which were selected with probability proportional to the square root of the number of teachers in the school, and sampling fractions varied markedly by domain, particularly by state, for public schools and by affiliation group for private schools. The reductions in effective sample sizes for national estimates implied by the above design effects thus mainly reflect the multiple objectives for SASS and the inevitable compromises in sample design that need to be made.

3.4 CONTENT

The content areas of the School Principal Survey questionnaire remained generally the same across rounds, although there were some changes in questionnaire items. The questionnaires are designed to obtain information about:

- The training, experience, professional background, salary and benefits, career plans, and demographic characteristics of school principals;
- School and staffing program decisions;

- Administrative practices;
- The types of school problems that principals view as serious; and
- Their influences on school matters.

The similarity of the questionnaires across rounds facilitates comparisons across time, one of the interests in SASS. Nevertheless, care must be exercised when interpreting change estimates between rounds, since question wording, ordering, context, or concepts may have changed.

A single questionnaire was used in Round 1 for all school principals, but separate questionnaires were used for principals of public and private schools in Rounds 2 and 3 (most of the data items on the two versions were the same). A third questionnaire, which had essentially the same content as the public school version of the questionnaire, was added in Round 3 for school principals in BIA schools.

Table 3-1 indicates the subject areas covered in the School Principal Survey questionnaire and the emphasis given to each area, by round. It also provides a measure of the changes in emphasis over time; for example, the number of items focussed on the educational background of the principal declined between Rounds 1 and 2 but increased dramatically in Round 3. New in Round 2 were questions dealing with perceptions of school educational goals and the quality of the teaching staff; also several new items were added to the list of school problems whose relative seriousness the principals were asked to evaluate. In Round 3 there were substantial increases in emphasis on the principal's administrative and other job experience and items dealing with his or her perceived influence on school matters.

Some questions were modified and others were deleted between rounds in response to reinterview results from the previous rounds, to pretest results, or to previous survey results. For Round 2, some of the changes made to the School Principal Survey questionnaires were based at least in part on findings from a review of 600 questionnaires from a pretest conducted in school year 1989-90 (Jefferson-Copeland and Bynum, 1990): the format and placement of codes for major and minor fields of study at the bachelor's and master's levels were revised, and skip patterns for a question on retirement plans were introduced to make clear that the second part of the question was not applicable to all respondents. Some questions were deleted between rounds because they were found to be unreliable in the reinterview programs or because they were found not to be useful.

Questions in Round 1 that were dropped in Round 2 included a breakdown of time spent by the principal on different kinds of school-related activities, programs for teacher evaluation and assistance to beginning teachers, and problems encountered in filling vacancies. A multiple response "mark all that apply" question asking about methods of compensating for unfilled teacher vacancies also was dropped from Round 2, due to the low response rate achieved in Round 1. The Round 2 question asking the principal to rate the school's teaching staff was not included in Round 3 because the principal's rating was an overall average for the school and this was felt by the Technical Review Panel to be too broad a measure of teaching quality.

For Round 2 it was estimated (as printed on the questionnaire) that it would take the principals an average of about 20 minutes to complete the questionnaires, and this increased to 30 minutes for

Table 3-1.—Overview of the questionnaire items in the School Principal Survey: Rounds 1-3

Categories of questions	Specific types of questions asked	Number of items[1]		
		Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total		108	105	173
Education and training	Degrees achieved and major fields of study	25	18	[2]29
	Professional training	4	7	6
Professional experience	Teaching experience: years and assignment fields	6	4	4
	Administrative experience: years and positions	5	5	[3]24
	Other job experience	6	6	[4]17
Career plan	Plan to remain as principal	0	2	6
Compensation	Salary	2	2	2
	Benefits	10	10	10
Demographics	Gender, age, race/ethnicity	3	5	5
Job-related activities	Activities and hours spent	11	0	0
Perceptions	Perceptions of school problems	13	22	24
	Perceptions of influence on school matters	9	15	[5]39
	Perceptions on school educational goals	0	3	3
Questions about schools	Teacher evaluation	1	3	0
Teaching staff	Teacher training	1	0	0
	Teacher recruitment	8	0	0
Miscellaneous	Respondent name and telephone number	3	3	4

[1]Refers to total number of response items. A question may have multiple response items.
[2]BA/BS degree granting university and location were added.
[3]Grade level of previous principal positions and breaks in principal career were added.
[4]New position categories and years of experience were added.
[5]The private school version had 27 items.
SOURCE: Zheng (1996).

Round 3. A question was added to the questionnaire in Round 2, and retained in Round 3, to ascertain how long it actually took principals to complete the questionnaire.

As part of a Round 3 study on ways to improve the mail return rates in SASS surveys, Cole, Palmer, and Schwanz (1997) examined the effect of response burden on mail response rates. They found that mail response rates decreased for each additional form respondents were asked to complete, suggesting a response burden effect. They recommended some types of nonmonetary incentives for respondents who complete several questionnaires. Although this was a statement about SASS in general, it may be particularly applicable to school principals who have to respond

to their own questionnaire, as well as possibly the school questionnaire, in addition to sending teacher lists to the U.S. Census Bureau. In Round 3, teaching principals were also eligible for selection into the teacher sample, thus increasing their potential for higher response burden. Additionally, the Student Records Survey questionnaires and the Library Survey questionnaires were addressed to the principal, although other staff members could be asked to complete these questionnaires.

3.5 DATA COLLECTION PROCEDURES

The principal or school head of each school selected for the School Survey was the only eligible respondent for the School Principal Survey. Collection procedures, which were essentially the same over the three rounds, are summarized in table 3-2. Generally, there was an advance mailing in late summer/early fall to LEAs and school principals to explain the nature of the SASS data collection activities and, in the case of principals, to ask them to submit a teacher list for use in selecting the sample of teachers for the Teacher Survey. This was followed by a mailing of the questionnaires for both the School Survey and the School Principal Survey in late fall or early winter. A second mailing of School Principal Survey questionnaires was sent to those who had not yet responded 5 or 6 weeks after the initial mailing. Telephone followup started 4 weeks after the second mailing for Round 1 and about 6 weeks after the second mailing for Rounds 2 and 3.

Table 3-2.—Data collection procedures for the School Principal Survey: Rounds 1-3

Procedure	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Advance mailing	Fall, 1987	Sept. 1990	Aug. 1993
Initial mailing	Late Jan.-Feb., 1988	Dec. 1990	Oct. 1993
Reminder postcards	None	None	1 week after initial mailing
Second mailing	6 weeks after initial mailing	5 weeks after initial mailing	5 weeks after initial mailing
Followup	By telephone, 4 weeks after second mailing	By telephone from 12 regional Census offices, 6-7 weeks after second mailing	By CATI from 2 Census centralized locations, 6 weeks after second mailing
Quality assurance/control	—	Regional office reviews of completed questionnaires	CATI edits and automated skip patterns

—Not available. (Data were not collected or not reported.)
SOURCES: NCES (1991b); Gruber, Rohr, and Fondelier (1993, 1996).

Two innovations were introduced in Round 3 following field testing in 1991-92. Reminder postcards were mailed to principals 1 week after the initial mailing of questionnaires, and a toll-free U.S. Census Bureau telephone number was established to enable principals to call for assistance in completing the questionnaire. The extent of use of the toll-free number is not known.

Overall, mail return rates for principals for Round 3 (75 percent for public school, 67 percent for private school, and 67 percent for BIA school principals) were about 10 percent higher than for Round 2 (67 percent for public school and 55 percent for private school principals). This increase in mail response rates in Round 3 may have been due to the introduction of the postcard, and the 2 weeks added to the response period before interview followup began.

In Rounds 1 and 2, followup of mail nonrespondents was conducted by field representatives in U.S. Census Bureau regional offices, who attempted to collect the data by telephone using a paper-and-pencil questionnaire. The Round 3 followup used a computer-assisted telephone interviewing (CATI) approach from two U.S. Census Bureau centralized locations. Table 3-3 shows that the CATI followup resulted in the completion of about 86 percent of the followup cases for both public and BIA school principals, and of about 68 percent for private school principals (see table 3-3). Field representatives in the U.S. Census Bureau regional offices dealt with cases by telephone for which CATI interviewers were unable to collect the data due to incorrect phone numbers (2 percent of public school followup cases, 4 percent of private school followup cases, and 1 percent of BIA school followup cases). Among the cases assigned to them, the field representatives successfully completed questionnaires for more than a third of the public and private school principals and all of the BIA school principals.

Table 3-3.—Principals requiring and completing telephone interview followup, by type of school and followup interview: Round 3

	CATI followup				Non-CATI followup			
	Total		Completed		Total		Completed	
School type	Number	Percent[1]	Number	Percent[2]	Number	Percent[3]	Number	Percent[4]
Public	2,410	25	2,072	86	158	2	55	35
Private	1,108	33	749	68	125	4	55	44
BIA	53	33	47	89	1	1	1	100

[1]Percent of sample cases in CATI followup.
[2]Percent of sample cases in CATI followup that were completed. Cases identified as noninterviews and out of scope for the survey during the CATI followup are not included.
[3]Percent of sample cases in telephone followup by field representatives.
[4]Percent of sample cases in telephone followup by field representatives that were completed. Cases identified as noninterviews and out of scope for the survey during followup are not included.
NOTE: Numbers do not total because of noninterviews and out-of-scope cases and because nonresponse cases may be switched between CATI and non-CATI followup.
SOURCE: Gruber et al. (1996).

The sizable amount of telephone followup in all rounds (around 30 percent) has raised concern about possible lack of comparability of responses due to different collection modes (Monaco et al., 1998). However, to date, no studies have been initiated to examine this issue.

Quality assurance. As in the case of the School Survey, in Rounds 1 and 2 the primary method of controlling the quality of the School Principal Survey data was through regional office reviews of questionnaires completed by U.S. Census Bureau field representatives in their telephone followups of mail nonrespondents. The procedures for the regional office reviews were identical to those used for the School Survey, as described in section 2.6.1. During the data collection for Round 2, regional office staff reviewed a sample of followup questionnaires completed by telephone

followup (Pasqualucci, 1991). An analysis of the forms used to record the results of these reviews showed that the main source of errors identified was a failure by several of the U.S. Census Bureau field representatives to record codes for major and minor degree fields. Also, a check item, designed to skip the next item on the questionnaire when it did not apply, had been left blank on several questionnaires. In Round 3, quality assurance also included the use of CATI capabilities, such as on-line data capture, coding, and some editing, as well as controlled skip patterns.

3.6 DATA PROCESSING

The sequence and nature of the data processing operations for the School Principal Survey in all rounds were essentially the same as those described for the School Survey in section 2.6. These included assigning a status to each questionnaire, performing a general clerical edit, assigning Federal Information Processing Standards (FIPS) codes for the School Principal Survey questionnaires, grouping questionnaires for data entry, performing data entry with 100 percent independent verification, assigning the preliminary interview status, performing computer editing that checked ranges and within- and between-item data consistency, making corrections where correct responses could be determined, and assigning a final interview status code. For those questionnaires completed by CATI, several of the above operations, such as coding and capture, were done during the interview. The resulting CATI data files were merged with those that had been data captured from paper questionnaires and underwent the same processes as the paper questionnaires from that point onward.

In Round 2, a computer pre-edit was also implemented. As noted in section 2.7.2, the computer pre-edit was designed to identify inconsistencies and invalid entries for key data items. This operation produced a list of problematic cases. These cases were reviewed, and respondents were recontacted if necessary. Any responses that were deemed to be erroneous but that could not be corrected were deleted. In this round, an on-line pre-edit correction system was tested for the School Principal Survey questionnaires, which was in line with plans to further automate SASS processing. A review of pre-edit reject rates, edit change tallies, and post-edit item response rates provided evidence of problems with skip patterns (Jenkins, 1992b). About 10 percent of the respondents or followup interviewers failed to provide a response to a check item leading to a skip pattern; the edit change tallies showed that respondents had apparently failed to follow all of the skip instructions and consequently answered some items that did not apply to them. There was no pre-edit for the School Principal Survey questionnaire in Round 3 because there were no major issues in inter-item inconsistencies to reconcile. The former pre-edit conditions were incorporated into the blanking edit of the computer edit procedure, and resulted in those error conditions being handled by imputation rather than manual review and correction.

The counts of changes made to the School Principal Surveys' questionnaire items as a result of the computer edit provide one indication of items that may have been problematic for respondents. Changes consist of deleting entries outside of acceptable ranges, correcting inconsistencies, and deleting responses that could not be corrected. A review of the extent of changes by question suggests that in Round 3, questions about school positions held before becoming a principal, about the number of breaks in service, and about plans for retirement were problematic for all school principals. Public school principals appeared to have difficulty with an item that required them to look up and enter a code representing their main teaching assignment for the most recent teaching

year, while private school principals had considerable difficulty in indicating the year in which they would be eligible to retire.

3.7 MEASUREMENT ERROR

As discussed in section 2.6.3, reinterview studies have been a part of the data collection activities for SASS surveys for all three rounds. Reinterviews were conducted in all three rounds with a sample of about 10 percent of the school principals responding to the School Principal Survey and at least 80 percent of these were successfully completed in each round.

In Round 1, a single reinterview questionnaire containing selected items from both the School Survey and School Principal Survey questionnaires was used. In the later two rounds, the reinterviews of school principals were conducted separately from the School Survey questionnaire reinterviews, using a subset of items only from the School Principal Survey questionnaire.

In the first two rounds, all reinterviews were conducted by telephone about 2 to 3 weeks after the original interview without regard to the mode of collection for the original interview (Gruber et al., 1996). In Round 3, the reinterview mode of collection was matched to the original mode of collection in order to reproduce the conditions of the original survey. The mail reinterviews occurred about 3 to 4 weeks after the original interview and the CATI reinterviews took place about 1 to 2 weeks after the original interview.

Reinterview results are analyzed using the *index of inconsistency* and *the L-fold index of inconsistency*, as described in section 2.6.3. The former measures the percent of total variance for an item with a dichotomous response that is accounted for by response variance. The latter is used for closed response items with more than two response categories; it is a weighted average of the simple index over all categories. As a rough rule of thumb, response variance is considered to be low when the index of inconsistency is less than 20 percent, moderate when it is between 20 and 50 percent, and high when it is greater than 50 percent. Table 3-4 shows reinterview results for all rounds.

Table 3-4.—Number of School Principal Survey reinterview items, by round, type and index of inconsistency: Rounds 1-3

	Round 1 (1987-88)		Round 2 (1990-91)		Round 3 (1993-94)	
Index of inconsistency	Factual	Opinion	Factual	Opinion	Factual	Opinion
Total questions	11	22	26	0	43	32
Low (0-19%)	1	0	5	0	29	0
Moderate (20-50%)	4	3	10	0	11	0
High (51-100%)	4	19	10	0	3	32
Not available*	2	0	1	0	0	0

*Did not meet the minimum requirements to compute a reliable estimate of the index of inconsistency.
SOURCES: Newbrough (1989), Royce (1992), Bushery, Schreiner, and Sebron (1998).

Almost half of the reinterview questions displayed high response variance in all rounds. Many of these were opinion or perception-type questions for which any discrepancies between the two interviews may be due in part to a real change in attitude or perception (Bushery et al., 1998). Nearly all the factual items in Round 3 had low or moderate response variance, and they appear to have performed better in this regard than the factual items in earlier rounds. However, it should be noted that results are not strictly comparable across rounds because different sets of questions and different methods were used for the reinterviews.

As just noted, opinion items generally had high levels of response variance. In Round 1, none of the 22 opinion items evaluated had low indexes of inconsistency and most were in the high range. These 22 items were of two kinds:

- A set of 13 items that asked principals for their views of the relative importance in their schools, on a 4-point scale, of each of 13 different kinds of problems that occur in some schools. Three of these problem types—student pregnancy, student use of alcohol, and student drug abuse—had estimated indexes in the moderate (20 to 50 percent) range; the rest were in the high range.

- A set of 9 items that asked principals for their evaluation, on a 6-point scale, of the relative influence of teachers, principals, and governing bodies on policies for establishing curricula, hiring new teachers, and discipline. All of these had indexes in the high range.

These two sets of opinion items were revised into an expanded form for the Round 2 School Principal Survey. However, they were not included in the Round 2 reinterviews, since it was decided that more information of value for question improvement through cognitive research and better questionnaire design would come from the reinterview results for factual items than from those for opinion items (Bushery, Royce, and Kasprzyk, 1992). In general, NCES decided to focus the Round 2 reinterview efforts on factual questions. The Round 3 reinterviews contained a single set of 32 opinion questions, all of which displayed high response variance.

A topic of concern with regard to response variance relates to the principals' college degrees and major fields of study. This was the only topic included in the reinterviews for both Rounds 1 and 2. As a consequence of the high response variance for this question in Round 1, the question format was substantially revised from the multiple response, "mark all that apply" format, so that in Round 2, separate sets of questions with Yes/No responses were asked about bachelor's and master's degrees. As a result, the index of inconsistency for master's degrees was lowered from 49.4 in Round 1 to 11.3 in Round 2. The index for bachelor's degrees had a value of 98.5 in Round 1, but is unavailable in Round 2.

Another set of questions that raised concern about response variance relates to the principal's previous positions. In Round 2, the question, "What other school positions, if any, did you hold before you became a principal?" provided a list of six positions for principals to choose from. The index of inconsistency ranged from about 32 percent to 97 percent (Royce, 1994). In Round 3, the list of positions was presented in a Yes/No format for each position. As a result, the index of inconsistency was reduced for all six of the positions to within a range from about 12 to 33 percent (Bushery et al., 1998) and the reduction was statistically significant for four of them (Feindt, Schreiner, and Bushery, 1997).

3.8 NONRESPONSE

Unit nonresponse. Weighted unit response rates by state for public school principals, and by association group for private school principals, for all rounds can be found in tables 3-5 and 3-6, respectively. Table 3-7 shows the weighted response rates for private school principals by type of private school. Sampled cases that were out of scope because the principal's school was not operating in the school year of reference for the survey or because the sampled school had no principal were excluded from the base of the response rates. In Round 2, these exclusions accounted for some 5 percent of sampled public school cases and 7 percent of sampled private school cases. In Round 3, they accounted for 4 percent, 9 percent, and 6 percent of sampled cases in the public, private, and BIA sectors, respectively.

In Rounds 1 and 2, a few LEAs requested NCES not to ask sample schools in their districts to participate in SASS. The nonresponse to the School Principal Survey due to district refusals was less than 0.5 percent of the eligible school principals in both Rounds 1 and 2 (Nash, 1988), and nonexistent in Round 3.

Tables 3-5 and 3-6 show that response rates have generally been high. Weighted response rates for principals in the public sector have not changed much over the three rounds, varying only between 94 and 97 percent, whereas rates for the private sector increased by about 10 percent between the first and second rounds (from 79 to 90 percent), and remained at almost that level (88 percent) in the third round. In all rounds, the response rate for public school principals was higher than that for private school principals. In Round 3, the response rate for BIA school principals was about 99 percent.

The response rates for principals of public schools were similar to those for public schools in the School Survey although slightly higher (the latter varied between 92 and 95 percent for the three rounds). The variation in response rates for private schools in the school survey (79 to 84 percent) between the three rounds was not as large as that for their principals. The response rate for BIA principals was the same as the BIA school response rate in Round 3.

There was substantial variation in response rates within each sector. For public school principals, 31 states in Round 1, 44 states in Round 2, and 44 states in Round 3 had weighted response rates of at least 95 percent. In the first and third rounds, the District of Columbia had the lowest weighted public sector response rate, at about 69 percent in Round 1 and 86 percent in Round 3. In Round 2, Maryland had the lowest weighted response rate (82 percent).

In the private sector, the range of weighed response rates by association group in Round 1 was from 56 to 98 percent. Most groups were in the range from 70 to 90 percent. In second and third rounds, with an expanded set of association groups, weighted response rates ranged from 72 percent to 100 percent; 12 of the 19 groups in Round 3 had rates of at least 90 percent. In all rounds the response rates for private school principals sampled from the area frame were substantially lower than for those sampled from the list frame. This finding has also been observed in the Private School Survey (Gruber et al., 1996).

Table 3-5.—Weighted response rates for the survey of public school principals, by state: Rounds 1-3

State	Weighted response rate (percent)*			State	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)		Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	94	97	97				
Alabama	98	99	99	Montana	98	99	96
Alaska	99	97	96	Nebraska	96	98	96
Arizona	99	97	95	Nevada	97	98	94
Arkansas	97	97	98	New Hampshire	99	99	100
California	92	96	95	New Jersey	95	92	96
Colorado	99	98	89	New Mexico	97	99	96
Connecticut	92	97	96	New York	89	90	93
Delaware	90	94	99	North Carolina	94	96	98
District of Columbia	69	89	86	North Dakota	95	99	99
Florida	99	94	98	Ohio	97	97	96
Georgia	95	95	99	Oklahoma	90	99	95
Hawaii	85	99	96	Oregon	98	97	97
Idaho	97	100	99	Pennsylvania	92	97	96
Illinois	97	99	98	Rhode Island	99	97	94
Indiana	98	100	98	South Carolina	91	99	97
Iowa	96	99	99	South Dakota	100	99	99
Kansas	94	98	94	Tennessee	95	98	97
Kentucky	92	99	95	Texas	92	98	97
Louisiana	92	94	98	Utah	100	99	99
Maine	99	98	93	Vermont	98	99	94
Maryland	81	82	95	Virginia	94	95	96
Massachusetts	93	97	99	Washington	99	94	99
Michigan	99	99	98	West Virginia	96	99	100
Minnesota	95	99	99	Wisconsin	94	97	99
Mississippi	98	98	98	Wyoming	89	96	98
Missouri	90	99	98				

*The basic weight is used to reflect the probability of selection.
SOURCES: NCES (1991b); Gruber, Rohr, and Fondelier (1993, 1996).

Table 3-6.—Weighted response rates for the survey of private school principals, by association group: Rounds 1-3

Association group	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total, area frame and list frame	79	90	88
Area sample	66	83	75
List sample	—	92	88
List sample by association group:			
Association of Military Colleges and Schools of U.S.	92	96	89
National Catholic Education Association, Jesuit Secondary Education Association	91	96	93
Friends Council on Education	85	94	99
National Association of Episcopal Schools	88	94	86
National Association of Hebrew Day Schools	72	86	86
Solomon Schechter Day Schools		98	98
Other Jewish		72	78
Lutheran Church – Missouri Synod	88	97	100
Evangelical Lutheran Church - Wisconsin		98	95
Evangelical Lutheran Church in America		99	98
Other Lutheran		97	98
General Conference of Seventh Day Adventists	89	95	93
Christian Schools International	98	94	74
American Association of Christian Schools	56	73	82
National Association of Private Schools for Exceptional Children	85	95	97
American Montessori Society Schools, other Montessori	79	92	90
National Association of Independent Schools	76	94	90
National Independent Private School Association	‡	‡	100
Other private schools	73	85	82

‡Not applicable. (Not listed as a separate association group.)
*The basic weight is used to reflect the probability of selection.
—Not available. (Data not collected or reported.)
SOURCES: NCES (1991b); Gruber, Rohr, and Fondelier (1993, 1996).

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Table 3-7.—Weighted response rates for survey of private school principals, by type of private school: Rounds 2 and 3

Private school type	Weighted response rate (percent)*	
	Round 2 (1990-91)	Round 3 (1993-94)
All private principals	90	88
Catholic	97	92
Parochial	96	92
Diocesan	98	93
Private order	98	89
Other Religions	85	83
Conservative Christian	82	83
Affiliated	91	82
Unaffiliated	80	84
Nonsectarian	90	90
Regular	86	91
Special emphasis	93	89
Special education	95	89

*The basic weight is used to reflect the probability of selection.
SOURCES: McLaughlin, O'Donnell, Ries, Broughman (1995); McLaughlin and Broughman (1997).

Analytic studies were conducted for the second and third rounds to examine variations in response rates for different categories of school. Some results are displayed in table 3-8. The study by Scheuren et al. (1996), which investigated variations in response rates for the first four characteristics in the table for Round 2, used a multiple comparison test with a 10 percent significance level for each characteristic. In the table, S denotes a significant difference in response rates between at least one pair of categories for the characteristic; NS denotes no significant differences. Some significant category differences were found by region and school size for both public and private schools, by urbanicity for public schools, and by school level for private schools. However, as the table shows, the response rate differences are not great, particularly in the case of public schools.

Monaco et al. (1998) performed similar analyses for Round 3, including the four characteristics examined in the Round 2 study and adding the characteristics displayed in the lower part of table 3-8 (some of which relate only to public schools, others only to private schools). They used an overall test of differences across categories (Rao-Scott chi-squared statistic); the significance level reached is indicated by the *P*-value in the table. Differences were deemed significant if the *P*-value was smaller than 0.05. Round 3 exhibits a similar pattern of significance/nonsignificance for the first four characteristics as Round 2.

Table 3-8.—Weighted response rates for the Survey of School Principals, by selected characteristics: Rounds 1 and 3

Characteristics	Weighted response rate (percent)[1]			
	Round 2 (1990-91)		Round 3 (1993-94)	
	Public	Private	Public	Private
Region:				
West	97	91	95	87
South	96	86	97	84
Northeast	94	91	96	86
Midwest	99	92	98	93
	S[2]	S[2]	P=0.034	P<0.001
Urbanicity:				
Central city	94	90	95	89
Urban fringe/large town	96	94	96	87
Rural	99	86	98	85
	S[2]	NS[3]	P=0.002	P=0.156
School level:				
Combined	96	84	97	78
Secondary	98	94	97	93
Elementary	96	93	96	92
	NS[3]	S[2]	P=0.074	P<0.001
School size:				
1-149	97	86	98	84
150-499	97	94	97	91
500-749	97	92	97	92
750+	95	93	95	92
	S[2]	S[2]	P=0.005	P<0.001
School type:				
Nonregular	‡	‡	98	‡
Regular	‡	‡	97	‡
			P=0.009	
Minority enrollment:				
<5.5%	‡	‡	98	‡
5.5-20.5%	‡	‡	97	‡
20.5-50.5%	‡	‡	97	‡
>50.5%	‡	‡	94	‡
			P<0.001	
School sampled with certainty:	‡	‡	97	‡
Yes	‡	‡	97	‡
No			P=0.961	
School sampled in 1990-91:				
Yes	‡	‡	97	92
No	‡	‡	97	87
			P=0.768	P=0.004
Submitted a teacher list:				
Yes	‡	‡	97	‡
No	‡	‡	77	‡
			P<0.001	
1991-92 PSS status:				
Respondent	‡	‡	‡	89
Nonrespondent	‡	‡	‡	48
Not in 1991-92 PSS	‡	‡	‡	76
				P<0.001

‡Not applicable.
[1]The basic weight is used to reflect the probability of selection.
[2]S indicates a significant difference between the response rates for at least some of the levels of the variable at the 10 percent significance level.
[3]NS indicates there are no significant differences at the 10 percent significance level.
SOURCES: Scheuren et al. (1996); Monaco et al. (1998).

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The new characteristics added for the Round 3 analyses show a variation in response rate by minority status and school type for public schools, and also by response to other data collections in both the public and private sectors. The small proportions of principals in public schools who failed to provide teacher lists for SASS and in private schools who were nonrespondents to the Private School Survey had appreciably lower response rates in the School Principal Survey than principals in schools responding to those data collections. Principals in private schools sampled for Round 2 of SASS had a higher response rate (92 percent) than those in schools not sampled (87 percent) in Round 2. This finding is not surprising, given overlap procedures between Rounds 2 and 3, specified in the sample design: the sample overlap in Round 3 of private schools in affiliation groups with high response rates in Round 2 was 30 percent, whereas that in affiliation groups with low response rates was minimized (see section 2.3).

Both studies extended their analyses to develop logistic regression models predicting response rates using the characteristics studied as explanatory variables. Details are presented in the reports. Since the differences in response rates by category are not that large, the models are not highly predictive. The results obtained from the two analyses are inconsistent; possible reasons are suggested by Monaco et al. (1998) (e.g., difference between the 1990-91 SASS sample and the 1993-94 sample, different procedures used to fit the logistic regression models).

Monaco et al. (1998) also examined patterns of response/nonresponse across the various SASS surveys in Round 3. One of their findings was that the response rate in the School Principal Survey for principals in public schools that responded to the School Survey (98 percent) was significantly higher than that for principals in public schools that did not respond to the School Survey (78 percent).

Item nonresponse. Table 3-9 summarizes item response rates for all three survey rounds of the School Principal Survey. In making comparisons across rounds it needs, of course, to be recognized that the questionnaires changed between rounds (see section 3.4). Item response rates were highest in Round 2, with all items on the public school principal questionnaire and all but a few items on the private school principal questionnaire having item response rates of 90 percent or higher.

The lowest item response rates in Round 1 (70 percent for public schools and 72 percent for private schools) were for a multiple response "mark all that apply" item concerning methods of compensating for unfilled teacher vacancies. The items with the lowest response rates in Round 2 were items immediately following skip instructions, suggesting that some respondents may have misunderstood these instructions (Jenkins, 1992b). On the public and private school questionnaires in Round 3, a question that asked for school positions held before becoming a principal and for the number of years in those positions had several category response rates lower than 75 percent. Additional questions on the private school principal questionnaire that had response rates lower than 75 percent were: a question asking for the year in which the principal would become eligible to retire from his or her position as principal (74 percent response); a question asking for the year in which the principal plans to retire from his or her position as principal (64 percent response); and a question asking whether the principal, if American Indian or Alaska Native, was enrolled in a state

Table 3-9.—Percent of items with selected response rates for the Survey of School Principals, by sector: Rounds 1-3

Sector and round	Percent of items with response rates: ≥ 90 percent	Percent of items with response rates: < 75 percent	Minimum of item response rate (percent)
Round 1 (1987-88)			
Public	86	2	70
Private	89	2	72
Round 2 (1990-91)			
Public	100	0	90
Private	98	0	80
Round 3 (1993-94)			
Public	92	4	65
Private	90	6	55
BIA	91	1	72

SOURCES: NCES (1991b); Gruber et al. (1996).

or federally recognized tribe (54 percent response). On the BIA school principal questionnaire, only the "other" category part of the question asking for school positions held before becoming a principal and for the number of years in those positions had a response rate lower than 75 percent.

3.9 ESTIMATION

Imputation. Item nonresponse was handled in Rounds 2 and 3 by imputation. Imputation was not employed in Round 1 because of time and budget constraints in the processing cycle (Kaufman, 1991). However, imputations were later done and can be found on the CD-ROM (NCES, 1998) containing data from all three rounds.

In Round 1, some items were assigned values as part of the computer edit and in preceding operations based on other information available on the School Principal Survey or associated School Survey questionnaires. Missing responses after this stage were left blank. These missing responses were treated as zero values in the ED tabs and analytic reports, thus leading to an underestimation of totals.

In Round 2, missing responses on the School Principal Survey questionnaire were imputed *after* completion of the imputation of missing responses on the School Survey questionnaire. The imputations were performed in a way that produced consistency between data from the two questionnaires. Certain items were common to both questionnaires, and the first step in the imputation process was to carry over values for these common items, whether reported or imputed, from the school records. Following this first step, imputation for the remaining missing or inconsistent items for principals proceeded in two stages: logical imputation based on other items reported for the principal, following defined rules, and hot deck imputation that assigned responses from other principals with similar characteristics. Specific details are provided in chapter VIII of

the *1990-91 Round Data File User's Manual* (Gruber, Rohr, and Fondelier, 1993) and in SASS Specifications Memoranda. Imputation flags were included on final data tapes.

In Round 3, as in Round 2, questionnaire items that should have had answers but did not, had values imputed for them. Where possible, values were deduced from other questionnaire data (stage 1 methods); otherwise they were imputed by hot deck imputation methods, with the value for a missing response being taken from a responding case with similar characteristics (stage 2 methods). All but a few exceptional cases of imputation were performed at stages 1 and 2 using computer processing. Manual (stage 3) methods occurred when there was no responding donor for hot deck imputation, when the imputed value was outside its acceptable range, or when there were only a few unanswered cases for an item. BIA School Principal Survey questionnaires were manually imputed because of their relatively small number and because item response rates were generally high. Imputation flags were included on final data tapes.

Weighting. In all rounds, the weighting procedures for the School Principal Survey were of the same form as those used for the School Survey (described in section 2.7.4), using overall weights that were the product of four factors: a basic sampling weight; a sampling adjustment factor; a school principal nonresponse adjustment factor; and a frame ratio adjustment factor. Since these surveys were fielded separately, there were some instances in which a questionnaire was obtained for the school principal but not for the school (and vice versa). Also, as noted above, some schools had no principals. For these reasons, weighting was done separately for the School Survey and the School Principal Survey.

As discussed in section 3.8, an analysis of response rates by state or association, urbanicity, school level, and school size showed some response rate differences across subgroups. All of these classification variables were used in some way for nonresponse adjustments in order to reduce the potentially biasing effects that this differential nonresponse could have on survey estimates.

Variance estimation. The computation of sampling errors for the School Principal Survey follows the same procedures that were used for the School Survey (see section 2.7). In the first and second rounds, a balanced half-sample replication (BHR) variance procedure (also known as balanced repeated replication (BRR)) was used to estimate sampling errors. Replicate weights for use in such estimates of sampling error are included on all SASS public-use microdata files. In Round 1 the replicates and replicate weights were developed independently for schools and school principal, but using the same general rules (Kaufman, 1991). In Round 2 the replicates for school principals were the same as those used for their schools (Kaufman and Huang, 1993). In Round 3, unlike the previous two rounds, the BRR variance estimation method was replaced by a bootstrap variance estimation method (see section 2.7).

The estimated coefficients of variation (CVs) for selected estimates from Round 3 of the School Principal Survey are shown in table 3-10 for public school principals and table 3-11 for private school principals (where the CV is the standard error of the estimate divided by the estimate). The CVs for the percent of public school principals whose highest earned degree is a master's degree are less than 10 percent for all states except Connecticut (11.2 percent), Georgia (17.2 percent), Kentucky (11.3 percent), and Minnesota (15.6 percent). In these cases, the large CV can be

Table 3-10.—Selected estimates and coefficients of variation (CVs) for public school principals, by state: Round 3

State	Percent whose highest degree earned was master's degree	CV (percent)	Percent who worked as a department head before becoming a principal	CV (percent)	Average total earned income	CV (percent)
All public school principals	63.4	1.0	19.6	2.7	$54,858	0.2
Alabama	42.7	7.9	10.7	20.5	45,554	1.0
Alaska	69.1	4.1	16.5	11.3	65,982	1.4
Arizona	66.5	5.9	20.5	19.1	54,092	1.1
Arkansas	72.4	4.1	9.5	23.6	41,797	1.1
California	68.2	4.6	22.1	10.5	62,499	0.8
Colorado	62.3	7.7	28.5	12.2	52,585	1.1
Connecticut	16.6*	11.2	16.4	14.6	76,803	0.7
Delaware	73.9	4.7	28.0	12.8	63,921	1.0
District of Columbia	76.2	5.4	44.5	10.7	66,616	0.7
Florida	70.9	4.7	42.0	8.0	57,684	0.9
Georgia	13.7*	17.2	21.9	10.3	54,763	0.7
Hawaii	50.9	8.3	64.7	8.7	53,425	0.7
Idaho	67.1	4.8	15.5	14.1	45,293	1.3
Illinois	68.1	3.8	20.1	9.7	56,099	1.0
Indiana	54.9	6.6	17.8	16.0	54,325	0.7
Iowa	75.4	4.9	15.7	22.4	48,524	1.2
Kansas	70.2	4.4	14.4	14.1	49,932	1.2
Kentucky	40.3	11.3	14.1	20.1	52,279	0.9
Louisiana	66.3	4.4	25.3	9.8	43,237	0.8
Maine	68.6	6.7	14.1	16.7	46,769	1.4
Maryland	78.3	3.2	30.2	9.2	64,258	0.8
Massachusetts	66.6	4.5	14.9	12.6	56,960	0.7
Michigan	61.9	6.3	20.1	17.6	62,516	1.1
Minnesota	19.8*	15.6	18.8	17.0	55,500	1.4
Mississippi	58.2	6.8	17.3	14.7	40,930	0.7
Missouri	53.0	8.9	10.4	19.4	47,529	1.6
Montana	86.7	3.2	19.2	16.4	42,382	1.0
Nebraska	59.1	7.9	18.7	20.1	45,569	2.8
Nevada	69.8	5.2	24.4	11.7	60,677	0.6
New Hampshire	69.3	6.4	19.5	15.1	51,193	1.2
New Jersey	72.9	5.7	15.1	18.7	75,863	1.1
New Mexico	73.7	5.3	23.3	17.0	42,068	0.9
New York	40.8	9.7	22.4	12.1	69,936	1.6
North Carolina	46.0	8.3	27.3	12.4	50,548	1.1
North Dakota	59.1	6.2	10.2	19.4	36,095	2.0
Ohio	80.8	3.9	18.4	16.3	$53,409	1.4
Oklahoma	71.6	4.2	14.1	13.0	41,599	0.7
Oregon	61.5	7.5	24.8	14.0	51,798	1.7
Pennsylvania	63.7	7.6	14.7	20.5	60,995	1.2
Rhode Island	73.1	6.3	11.4	22.4	56,608	0.6
South Carolina	53.9	8.2	19.8	15.1	50,805	0.8
South Dakota	82.2	2.7	10.6	15.8	37,063	1.0
Tennessee	67.2	6.9	10.9	19.3	44,774	1.4
Texas	75.6	3.1	20.2	14.2	49,205	0.8
Utah	55.4	4.8	22.4	9.3	47,920	0.9
Vermont	63.5	7.5	14.7	17.6	49,234	2.7
Virginia	76.7	5.1	18.0	20.0	54,801	1.3
Washington	75.7	5.0	19.9	15.0	60,782	1.0
West Virginia	84.0	4.1	6.8	26.5	44,091	0.9
Wisconsin	68.1	6.0	17.9	20.0	54,956	1.1
Wyoming	68.8	3.9	24.5	15.3	47,649	1.2

*Percents are small in these states because the majority of principals have a degree higher than a master's degree.

SOURCE: CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

Table 3-11.—Selected estimates and coefficients of variation (CVs) for private school principals, by association group: Round 3

Association group	Percent whose highest degree earned was master's degree	CV (percent)	Percent who worked as a department head before becoming a principal	CV (percent)	Average total earned income	CV (percent)
All private school principals	59.0	1.1	18.7	4.4	$22,739	0.9
Catholic	63.6	1.1	23.5	5.2	22,356	0.8
Parochial	70.6	1.2	18.6	8.6	20,058	0.9
Diocesan	62.1	2.2	27.4	8.7	22,720	1.1
Private order	45.0	3.5	44.2	8.0	28,426	1.8
Other religious	57.8	1.9	14.5	9.5	20,440	2.1
Conservative Christian	66.3	2.6	18.8	13.1	16,839	2.2
Affiliated	55.0	2.9	15.0	11.3	23,995	1.6
Unaffiliated	50.8	4.8	8.0	20.0	20,471	5.8
Nonsectarian	52.9	2.7	20.2	10.2	26,712	1.5
Regular	52.2	3.2	25.8	11.6	26,768	2.0
Special emphasis	54.5	3.9	11.1	22.7	25,431	2.7
Special education	53.7	7.8	22.2	27.3	27,763	3.4

SOURCE: CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

explained by the low percent of principals whose highest earned degree is a master's degree (generally less than 20 percent as compared with the national average for public school principals of 63.4 percent). The CVs for the percent of public school principals who worked as department heads before becoming principals are considerably larger: all but a few exceed 10 percent and about one in five exceeds 20 percent. These CVs are higher than those for the master's degree item because of the lower percent of principals involved: overall, only 19.6 percent of public school principals had been department heads before becoming principals as compared with 63.4 percent whose highest earned degree was a master's degree. The estimates of average total earned income for public school principals by state are very precise, with only three of the states having CVs of 2 percent or more.

Table 3-11 displays similar findings for private school principals. The CVs for the percent of private school principals whose highest degree is a master's degree are less than 10 percent for all association groups. The CVs for the percent of private school principals who worked as department heads before becoming principals are considerably larger, and the CVs for average total earned income are small for all association groups.

3.10 EVALUATION OF ESTIMATES

Few alternative data sources can be used in comparisons with estimates obtained from the School Principal Survey. Prior to the publication of the 1987-88 Round 1 SASS estimates, the survey estimates of numbers of public and private school principals were compared with principal and school counts from other sources, including the 1985-86 Private School Survey (PSS), the 1987-88 Common Core of Data (CCD), the Quality Education Data File (QED), which served as the frame for the School Survey, and an estimate of the number of public school principals from a list compiled by a commercial market data firm (Hammer, 1989b). Differences among the estimates were relatively small and were deemed to be accounted for by differences in definition and time reference among the estimates examined. Differences between SASS estimates of number of schools and number of principals in both sectors were accounted for primarily by the existence of schools with no principals.

In an attempt to check on the quality of estimates of public school principals' salaries, state education agencies in several states were asked to provide independent information on average principals' salaries in their states (Hammer, 1989a). Four states—Alabama, Illinois, Kansas, and Maryland—provided information but, in general, the salaries provided either were not directly comparable with the survey estimates or there was not enough supporting documentation to determine the extent of comparability.

Also for Round 1, a pre-publication review of estimates based on a set of items about hours spent by principals on school related activities led to a recommendation, which was followed, that these estimates not be included in publications (Hammer, 1990). Three factors were cited as possibly leading to under-reporting of hours: there was no imputation for individual items for which there was no response (see section 3.9.2); there was no "other" category in which to report hours not covered by the named activity categories; and the set of items did not ask for any distinction between time spent during school hours and time spent after school hours.

The Round 2 estimates for school principals were compared with corresponding data from Round 1. No unusual differences were noted (Hammer, 1992). For Round 3, similar comparisons showed no deviations.

4. THE TEACHER DEMAND AND SHORTAGE SURVEY

4.1 INTRODUCTION

The Teacher Demand and Shortage Survey (TDSS), first conducted in 1983-84, is the oldest of the group of surveys that was joined together to form the Schools and Staffing Surveys (SASS). The purpose of the TDSS is to collect data that can be used to measure the supply and demand for elementary and secondary school teachers, to identify teacher categories, types of schools, and types of school districts for which shortages exist, and to examine policies that may influence teacher supply and demand (salary, benefits, retirement plans, and incentive plans for hiring). The survey also collects some information on library media specialists/librarians. Information for public schools and for BIA schools that are part of an LEA is obtained directly from the school district (LEA). In the case of private schools and BIA schools not part of an LEA, the information is collected from the school.

This chapter does not repeat the design features and procedures already described in chapter 2. Like the previous chapter, it has sections covering the main phases of the survey operations: sampling frames (4.2), sample design (4.3), content (4.4), data collection procedures (4.5), data processing (4.6), measurement error (4.7), nonresponse (4.8), estimation (4.9), and evaluation of estimates (4.10). Most of the material in this chapter concerns the public sector component of the TDSS. The main features of the private sector and BIA components, especially for Rounds 2 and 3, have been described in chapter 2 in connection with the School Survey.

4.2 SAMPLING FRAMES

The target population for the public school sector for all three rounds of the TDSS (Round 1 in 1987-88, Round 2 in 1990-91, Round 3 in 1993-94) consisted of U.S. public school districts, often called LEAs. An LEA is a local government agency administratively responsible for providing public elementary and/or secondary instruction and educational support services, operating under a public board of education. A few LEAs do not operate schools but hire teachers for schools in other LEAs; an example would be a special education program whose teachers are placed in regular schools. Such LEAs were included in the target population if they employed teachers in elementary and/or secondary schools. LEAs that did not hire any teachers were excluded. Public schools operated outside the local public school system, such as those operated by the BIA and the U.S. Department of Defense (DOD), were each treated as a separate LEA. Thus, BIA schools not found on the CCD file are considered separate entities, whereas BIA schools on the CCD file are considered part of the public school district (LEA) in which they are located. For DOD schools, if there was more than one school on a base, then only one TDSS questionnaire was sent to the base. In Minnesota and Missouri, a small number of schools operated by state agencies (e.g., state operated school for the blind) were excluded in error from the LEA target population in Round 2, although they were included in the first and third rounds.

The target population for the private school sector consisted of all private schools eligible for the School Survey, as described in section 2.2. The sampling frame, sample design and selection procedures for the private school sample are described in chapter 2. Similarly the samples of Indian schools were obtained by the procedures described in chapter 2.

The sample of LEAs that operate public schools is obtained by including in the TDSS all LEAs associated with one or more schools sampled for the School Survey. Thus, the sampling frame for those LEAs is the frame used for selecting public schools, the Quality Education Data (QED) for Round 1 and the CCD for Rounds 2 and 3 (see section 2.4.1).

A relatively small number of LEAs that do not operate public schools but do hire teachers were included in the sampling frame at each round. There were 1,077 such LEAs on the frame in Round 1, 1,352 in Round 2, and 651 in Round 3. The decrease in this type of LEA in Round 3 was due to the closure of some and the consolidation of several such LEAs into a single LEA. Almost all LEAs without schools were declared out of scope because they did not hire teachers.

Frame evaluation. As already noted in section 2.4.3, in Round 1 a comparison of public school estimates with counts from the Public Elementary/Secondary School Universe Survey of the CCD series of surveys showed that 275 LEAs with only elementary schools had not been included in the school frame based on the QED list for Round 1. As a result, the numbers of LEAs at the national level and especially for Nebraska were underestimated from the sample for that round. These schools, and hence the corresponding LEAs, were included in the frame for later rounds.

As part of the postprocessing edit in Round 2, weighted estimates of the counts of LEAs by state were compared with the 1988-89 CCD, which served as the sampling frame for Round 2, and the weighted numbers of teachers and students reported by the sampled LEAs were compared with the corresponding numbers from the 1990-91 CCD, covering the same reference year. Eight states had estimates of public school teachers or students from the TDSS that exceeded the CCD counts by 15 percent or more. Examination showed that these estimates were overestimates caused by the erroneous inclusion in the TDSS of LEAs that were supervisory unions or other districts that did not hire teachers. All such districts were reclassified as out of scope and their data were eliminated from the estimates.

Estimates of LEAs and full-time equivalent (FTE) teachers from the survey compared to frame totals and external sources in Round 3 (see section 4.10) identified no frame deficiencies. LEA estimates by state were compared to the numbers on the 1991-92 CCD file. Explanations for the discrepancies observed included low response rates to the TDSS and possible LEA closings that may have occurred between the sampling year and the year of data collection (Gruber, Rohr, and Fondelier, 1996). TDSS estimates of the numbers of FTE teachers per state were compared to counts from CCD's State Nonfiscal Survey data (Johnson, 1995). Possible reasons for discrepancies did not include frame deficiencies.

4.3 SAMPLE DESIGN

The sample design for selecting public schools is described in section 2.4.1. In all three rounds, the TDSS included all LEAs associated with one or more of the sampled public schools. This design gave every LEA that operated schools a calculable non-zero probability of selection (equal to one minus the probability that none of its schools was selected for the School Survey).

However, an exception to this basic approach occurred in Delaware, Nevada, and West Virginia. A simulation study prior to Round 1 showed that the sampling errors of LEA estimates in those

three states would be large even though the proposed selection procedures would have included most of the LEAs in all three states in the sample (Kaufman, 1991, p.27). In all rounds, therefore, every LEA in those three states was treated as a separate stratum for the purpose of sampling schools, so that all of the states' LEAs were included in the sample.

The sample of LEAs that did not operate schools but that hired teachers was obtained by selecting a sample of all LEAs that did not operate schools and eliminating those that did not hire teachers at the data collection stage. LEAs that did not operate schools were sampled differently in each round. In Round 1, those that reported having teachers were sampled with probability proportional to the square root of the number of teachers. Those LEAs with teacher information unknown were sampled with equal probability at a rate of about 1/20 from a list ordered by state, urbanicity, percent minority, first three digits of ZIP Code and LEA identification (ID). In Rounds 2 and 3, all LEAs without schools were selected using equal probability systematic sampling at the rates of 1 in 10 and 1 in 6, respectively. In Round 2, in order to give the benefits of implicit stratification, the list was ordered before sampling by metropolitan area status, three-digit ZIP Code, and LEA ID. In Round 3, the sort variables for these LEAs were LEA type code (indicating who operates the agency), state, number of teachers, and LEA ID. The sampling of LEAs that did not operate schools but hired teachers was eliminated for Round 4 since it added more to the variance than it contributed to the scope.

Table 4-1 displays the sizes of the LEA samples selected for the TDSS for the first three rounds. The total eligible sample declined slightly over the rounds, dropping from about 5,600 LEAs in Round 1 to under 5,400 in Round 3. A substantial proportion of sampled LEAs that did not operate schools were found to be ineligible. LEAs were classified as ineligible (out of scope) if the district no longer existed; the district served only prekindergarten and/or kindergarten students; the district served only postsecondary or adult education students; or the agency was not a school district or other public agency that employed elementary and/or secondary teachers. Information on the sample size for private schools can be found in section 2.4.2.

Table 4-1.—Local education agency (LEA) sample sizes: Rounds 1-3

Category	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total eligible sample	5,594	5,394	5,355
LEAs with schools	5,586	5,380	5,350
LEAs without schools	70	135	109
Eligible LEAs without schools	8	14	5

SOURCES: Kaufman (1991); NCES (1991); Jabine (1994); Gruber, Rohr, and Fondelier (1993, 1996).

4.4 CONTENT

In all three rounds, the TDSS collected data:

- To measure the supply and demand for elementary and secondary school teachers;

- To identify teacher categories and types of schools and school districts for which shortages exist;

- To examine policies that may influence teacher supply and demand (salary, benefits, retirement plans, and incentive plans for hiring); and

- In Rounds 2 and 3, to estimate the number of teachers who held certification in their field of assignment.

Boe (1996) has noted the TDSS is the only source of some teacher data, such as district teacher counts, hiring criteria, and collective bargaining agreements.

Rounds 2 and 3 included as a final question "Not counting interruptions, how long did it take to complete this survey?" For mail responses, this item was completed by the person responding for the LEA; for followup telephone interviews, the item was completed by the interviewer. In Round 2, the median time for completion was 1 hour and 15 minutes, with an interquartile range of 90 minutes. About 5 percent of the LEAs required more than 5 hours to complete the questionnaire and 1 percent required more than 10 hours.

Content changes. There were only a few changes in survey content between Rounds 1 and 2. To reduce the burden on respondents, a complex accounting-style matrix item that called for data on FTE teachers and teaching positions by level and specialty was dropped. (See also the State Data Project in section 4.7). Conversely, items were added in Round 2 to collect information on demand for and shortages of librarians and on pension portability.

Items in the Round 2 questionnaire asking about the previous year's enrollment, the number of postsecondary students and teachers, teacher benefits, and merit pay for teachers were deleted from the Round 3 questionnaire. Nonetheless, the Round 3 questionnaire contained five sections compared to the two sections of the previous round (enrollment and teaching positions, and district policies), reflecting significant additions in content. The five sections in the Round 3 questionnaire were as follows:

- Enrollment information—counts of students by grade level and race/ethnicity, number of days in the school year, and data on the release of results from standardized tests.

- Teacher information—FTE counts of teachers employed by the LEA, counts of certified, itinerant, newly hired, and laid off teachers; vacant and abolished teaching positions; counts of teachers by race/ethnicity; LEA criteria for considering teaching applicants; and the number of newly hired teachers with emergency certification.

- Library media specialists/librarians information—FTE counts of librarians employed by the LEA, vacant librarian positions, abolished librarian positions, and librarians laid off at the end of the last school year.

- Programs and services—This new section included information on prekindergarten programs, Chapter 1 services, participation in the National School Lunch program, and enrollment choice programs.

- District policies—high school graduation requirements, drug abuse prevention and discipline policies, teacher salaries, teacher retirement plans, teacher incentive plans, and staff training programs.

The additional items reflected both recommendations included in various research reports and the need to supplement information gaps. Six of the questions added in Round 3 were pretested in the 1991-92 field test. Six other sets of questions included in the field test were not included in the Round 3 TDSS because of the following: they had low response rates, they were unclear and could lead to inconsistent or invalid data, they created undue response burden, or changed education research priorities.

4.5 DATA COLLECTION PROCEDURES

Questionnaires. In all three rounds, the TDSS used separate questionnaires for the sampled LEAs in the public sector and the sampled private schools in the private sector. In Round 1, the private school version was sent to the private schools sampled for the School Survey as a separate questionnaire. For Rounds 2 and 3, the TDSS and the School Survey questions for private schools were combined into a single questionnaire. A combined questionnaire was also used for Indian schools in Rounds 2 and 3.

Pretests. The questionnaires for Round 1 of the TDSS were field tested on 186 LEAs and 75 private schools (Nash, n.d.). Further in-depth interviews were conducted with 45 randomly selected respondents to the TDSS pretest to determine how the data were derived and what was included and excluded from reported counts. These in-depth interviews, which were conducted by telephone by professional staff members from both the U.S. Census Bureau and the National Center for Education Statistics (NCES), resulted in several changes being made to the questionnaire. These changes involved adding "head counts" to the instruction when asking for student enrollment; adding three new teaching fields in the elementary and secondary FTE positions by field matrix; adding an instruction to report bilingual teachers only in the bilingual category in this same matrix; allowing LEAs the option of reporting contracts in days or in months; and eliminating an item on partial retirement age/service requirements.

In the Round 2 pretest, questionnaires were mailed to 332 LEAs during the 1989-90 school year. Some potential reporting problems were identified (Healy, 1990a). One dealt with the categories used for grade level in questions about staffing and enrollment: prekindergarten, kindergarten, 1-6, and 7-12. Some districts use other grade structures for their school data—kindergarten to 5, 6-8, and 9-12, for example. In the pretest, 12 of 283 LEAs handled this problem by crossing out the grade level categories on their questionnaires and writing in new ones. This observation suggested the need for a clerical check of completed questionnaires to make adjustments in such cases.

Numerous instances of incomplete or incorrect reporting in the pretest were also observed with the matrix items that called for data on FTE teachers and positions by grade level and specialty. As noted earlier, these two items were dropped from the final questionnaire for Round 2.

A general observation from this pretest review was that the quality of questionnaires returned by mail appeared to surpass that of the ones that had been completed by telephone followups. This

may be because the questionnaire was difficult to complete by telephone and also because some of the telephone cases were "quasi refusals," with respondents reluctantly providing minimal data.

A pretest for Round 3 of SASS was conducted during the first half of 1992 with U.S. Census Bureau field representatives collecting the data by telephone. Debriefing comments from Census regional offices relating specifically to the public TDSS questionnaire dealt primarily with issues of respondent burden resulting from the complexity of the questionnaire (difficulty with breakdowns of counts into categories) and the requirements to complete matrix-style items (too much time required to complete such questions). Understanding of the FTE concept continued to be considered a problem and was reported as the most difficult and time-consuming area for respondents to understand and for interviewers to work with over the telephone; one U.S. Census Bureau interviewer was quoted as saying, "I have yet to find one respondent who I feel really understands the concept of FTE" (U.S. Census Bureau, 1992). The debriefing of the interviewers also indicated that the district administrators were the most difficult of all SASS respondents to contact and were the least cooperative. Furthermore, LEAs felt that they had too many similar surveys from the state and that the information being requested could be found elsewhere (1993-94 SASS pretest memorandum). While the CCD and other surveys at the state level probably do collect the same or similar information about counts of teachers and students, these sources have not been available for incorporation into the TDSS datafile (see the State Data Project in section 4.7). The items asking about FTE teachers were reduced in Round 3 and have been virtually eliminated in Round 4.

Procedures. In Rounds 2 and 3, the TDSS was essentially part of the School Survey for private schools and Indian schools. In Round 1, although a separate questionnaire was used for the private TDSS, the same data collection procedures used for the School Survey applied (see section 2.5).

Data collection activities for LEAs were generally the same as those described for schools in earlier chapters. Generally there was an advance mailing in late summer/early fall to LEAs and school principals to explain the nature of the SASS data collection activities. This was followed by a mailing of the TDSS questionnaires in late fall or early winter. A second mailing of questionnaires was sent to LEAs that had not yet responded by 5 or 6 weeks after the initial mailing, with telephone followup occurring later. However, there were a few notable differences between this and other SASS surveys.

In Rounds 2 and 3, unlike the first round, the advance letter mailed to LEA superintendents to introduce SASS also indicated that a U.S. Census Bureau representative would be calling to ask that they designate a staff member to take responsibility for completing the TDSS, thus allowing the TDSS to be the only SASS instrument addressed to a named person (Monaco, Salvucci, Zhang, Hu, and Gruber, 1998). If there was a designated staff member, the questionnaire was sent to that person. Otherwise, the questionnaire was mailed to the superintendent. Any knowledgeable LEA employee was allowed to respond to the questionnaire. For some LEAs, the data were provided by several respondents. In Round 3, in order to obtain data consistent with the CCD frame data, the range of grades for which information was desired also was clearly labeled. As for other Round 3 components of SASS, a toll-free U.S. Census Bureau phone

number was included on the questionnaire for use by respondents in need of assistance—in particular, if the LEA grade range was different from that shown on the questionnaire label.

In all three rounds, trained U.S. Census Bureau interviewers contacted mail nonrespondents by telephone in an attempt to complete the questionnaires. Paper-and-pencil instruments were used for all rounds. CATI was not used for followup in Round 3 because of time and budget constraints but is being used in Round 4. In Round 3, about 90 percent of sampled LEAs responded by mail. With the telephone followup cases, if the person contacted by telephone was unwilling to provide the information over the telephone, the interviewer tried to persuade the person to complete the questionnaire and return it by mail. Of the 590 followup cases, 574 (97 percent) were completed.

Quality assurance. As was done for all of the SASS surveys at each round, U.S. Census Bureau regional office staff reviewed a sample of the questionnaires completed by interviewers in their telephone followups of nonrespondents. The procedures were the same as those described for the School Survey in section 2.6.1.

4.6 DATA PROCESSING

The sequence and nature of the data processing procedures for all three rounds of the TDSS were essentially the same as for the other basic SASS surveys (see the processing procedures for the School Survey described in section 2.7.) In summary, these procedures included assigning a status code to each questionnaire to indicate its interview status, a general clerical edit to review items for legibility, grouping of questionnaires for data entry, data entry with 100 percent independent verification, assigning the preliminary interview status, computer editing (pre-edit and edit) that checked ranges and within-item and between-item data consistency, making corrections where deterministically possible, and assigning a final interview status code.

Editing. In Round 2, the most frequent reason for pre-edit rejection of LEA questionnaires was that the number of students or teachers was at least 35 percent greater than expected from the CCD. In Round 3, almost 20 percent of the sample LEA records were rejected for further review during the pre-edit based on 11 criteria. The three criteria that caused rejection most frequently were the following:

- The number of teachers was at least 25 percent greater than expected (10 percent);
- The number of students was at least 20 percent greater than expected (4 percent);
- The number of teachers was at least 20 percent less than expected (4 percent).

For rejected LEA cases, in all three rounds, U.S. Census Bureau staff reviewed the computer record and the questionnaire. When possible, unacceptable entries were corrected by using information on the questionnaire or sample frame information. Respondents were sometimes contacted to resolve problems in Rounds 1 and 2 but not in Round 3. Incorrect entries that could not be corrected were deleted from the record.

Despite the sizable percent of pre-edit rejections in Round 3, few changes were made to the LEA responses based on these rejections. Where changes were made, they consisted of correcting inconsistencies or deleting unacceptable responses that could not be corrected. Of the 165 variables in the pre-edit, only 15 variables had change rates greater than 1 percent and only 5 had change rates greater than 2 percent, where the change rate is the number of changes made to an item divided by the number of completed questionnaires. The 5 questions with change rates greater than 2 percent were the following: a question that asked for FTE teachers in the district for the grades 1-12 (4 percent); a question that asked for the total number of FTE teachers in the district (3 percent); a question that asked for the number of white, non-Hispanic teachers in the district (3 percent); a question that asked how many of the FTE teachers reported had standard/regular state certifications in their fields of assignment (3 percent); and a question that asked for the total number of students enrolled (2 percent).

After pre-edit corrections were made the data file was submitted to a computer edit that consisted of a range check, a consistency edit, and a blanking edit. Of the 166 variables in the Round 3 computer edit, change rates ranged from a low of 0.1 percent to about 46 percent; for 136 of the variables in the computer edit, the change rate was less than 10 percent. For the most part, the variables with the highest change rates were grade indicator variables that were to be checked off if the district offered the specified grade. Another question with a very high change rate asked for the high and low ends of the range of teachers' yearly base salaries in the district. This question was asked only if the LEA could not answer a prior question asking for more detailed information about the district's salary schedule.

4.7 MEASUREMENT ERROR

No reinterview studies were conducted for the TDSS in any of the three rounds. Frequently, more than one person in an LEA provided data, which could have caused difficulties in arranging for repeat data collections, especially if conducted by telephone. Therefore, unlike some of the other SASS surveys, there is no information on measurement errors available from this source. There are, however, a variety of studies that shed light on measurement error in the TDSS.

Teacher and student counts in Round 1. For Round 1, at the time the weights were being applied to the LEA sample records, it was observed that for some LEAs the numbers of students or teachers were much higher or lower than expected on the basis of prior year data from the CCD for the same LEAs. A listing was prepared of all LEAs for which (a) reported counts of students or teachers differed by 35 percent or more from expected counts, or (b) the student/teacher ratio was greater than 35 or less than 10. This listing contained 290 LEAs for which counts of students or teachers appeared to be incorrect, including 46 LEAs that appeared to have reported data for sample schools only, rather than the entire district.

Further review of the questionnaires for the 290 LEAs revealed several cases where LEAs had merged and one case that was out of scope because all teachers and students were preschool. There were also 33 LEAs for which the entire questionnaire had been completed for a single school, rather than the entire LEA. (This is the converse of the situation discussed in section 2.8 where it was found that some of Round 1 School Survey questionnaires had been completed for the entire LEA rather than the specified sample school.) These 33 sample LEAs were

reclassified as noninterview cases, reducing the response rate for the public TDSS by slightly more than 1 percent.

As a result of these findings and the actions taken, the sample weights had to be recalculated. For the LEAs that were not reclassified as noninterviews, values that were clearly incorrect were replaced by imputed values, based primarily on other items from the same questionnaire or data on the sample file (Fondelier, 1990). As described above, in Rounds 2 and 3, checks of LEA student and teacher counts were incorporated into the pre-edit procedures.

The State Data Project. In Round 1, many LEA respondents to the TDSS had difficulty completing two matrix items that called for detailed information on FTE teachers and positions by teaching level and specialty. Some of the state education offices suggested that they might be in a better position than the LEAs to report such data to NCES. A feasibility test of this approach, called the State Data Project, was included in the 1990 SASS Pretest for Round 2 (Healy, 1990b).

Initially, 11 states were selected to participate in the test. For these states, data for several items on the TDSS questionnaire were to be collected directly from the sample LEAs and also, independently and in computer-readable form, from the state education offices. Data from the two sources would be compared, on an item-by-item basis, for each of the sample LEAs.

Eventually, 7 state education offices were able to submit data tapes with the requested LEA data. Pretest interviews were completed for 82 of the 96 LEAs in the pretest sample for those states. For 24 of the 38 data elements compared, over 50 percent of the individual LEAs reported data that differed by 10 percent or more from the data provided by their state offices. On the basis of these results, NCES concluded that it would not be advisable to try to obtain data for sample LEAs from a centralized state source in Round 2 of SASS. It was also decided, as noted earlier, that the matrix items on FTE teachers and positions would not be included in the survey questionnaire for Round 2.

This outcome does not necessarily rule out the collection of some of the LEA data for the TDSS from state education offices in future rounds of SASS. In November 1991, NCES and the Council of Chief State School Officers convened a Workshop on Improving Reliability and Comparability of Staffing Data, the main purpose of which was to review the findings from the State Data Project. The participants concluded that state education agencies can report LEA data for selected items. The state participants expressed a desire to continue to work with NCES to develop a state reporting role in SASS, especially for the public sector component of the TDSS (Blank, 1992). However, the results of the State Data Project demonstrated that further research would be needed to better understand the nature of the discrepancies that were observed and to identify the specific items that could be adequately reported at the state level.

Measurement errors in Round 2. Indications of measurement error in Round 2 of the public TDSS came from several sources: an early review of unedited and edited questionnaires received from the field (Healy and Pasqualucci, 1991); memoranda submitted by census regional offices following the completion of SASS data collection for that round (U.S. Census Bureau, 1991a); a review of the forms completed by regional office staff for their reviews of questionnaires

obtained by U.S. Census Bureau interviewers in telephone followups of mail nonrespondents (Pasqualucci, 1991); and a review of pre-edit reject rates, edit change tallies, and post-edit item response rates (Jenkins, 1992a).

Types of measurement errors mentioned in these sources included the following:

- As noted in connection with the 1990 pretest, a few respondents changed the grade level categories for reporting enrollments and staff, for example from 1-6 and 7-12 to 1-8 and 9-12. This was observed in the early review of incoming questionnaires and a procedure was added to the clerical edit to check for this type of alteration.

- As in Round 1, many respondents failed to record decimal entries in the manner intended for the items relating to FTE staff and graduation requirements. In most instances, such reporting errors were detected and corrected either in clerical edits or as a result of consistency checks included in computer edits.

- Many respondents failed to observe skip instructions and unnecessarily completed an item on the overall range of base year teacher salaries in the district. This item was intended only for respondents who could not provide separate ranges for different levels of qualification. Failure to skip did not affect the accuracy of the data for these items.

- There were frequent discrepancies between component items and overall totals for two topics, one relating to FTE teachers and one to FTE librarians and media specialists.

In most instances, it was possible to detect errors of these kinds in the clerical and computer edits and to substitute correct or at least more nearly correct values on the basis of other information on the questionnaire or in the sample file, or from telephone contacts in the early stages of processing.

4.8 NONRESPONSE

Unit nonresponse. Since unit response rates relate only to the eligible population, sampled LEAs and private schools that were not operating in the school year of reference for the survey or failed to meet the definition for other reasons are excluded from consideration. In both Rounds 2 and 3, the percent of the initial sample of LEAs that was excluded for such reasons was relatively small, at around 4 percent. As noted above, in Round 1 a few questionnaires that were initially counted as interviews were excluded subsequently from the survey estimates because of reporting errors that could not readily be corrected; these cases were counted as nonrespondents if they were eligible for the survey.

Table 4-2 shows weighted unit response rates by state for LEAs for each of the rounds, and table 4-3 shows the corresponding rates for private schools. (In Rounds 2 and 3, the private TDSS was combined with the School Survey questionnaire, so that the response rates for these rounds are the same as those in table 2-13 for the School Survey.) The Round 1 weighted response rate for LEAs was about 25 percentage points higher than that for the private school TDSS questionnaire (91 percent vs. 66 percent). For Round 2, the weighted LEA response rate was

Table 4-2.—TDSS weighted response rates for public local education agencies, by state: Rounds 1-3

State	Weighted response rate (percent)*			State	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)		Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	91	94	94				
Alabama	97	96	94	Montana	89	95	94
Alaska	100	96	94	Nebraska	92	97	97
Arizona	92	90	99	Nevada	100	100	100
Arkansas	96	91	98	New Hampshire	84	93	87
California	90	91	91	New Jersey	84	86	77
Colorado	96	98	89	New Mexico	88	95	98
Connecticut	61	77	94	New York	91	96	94
Delaware	95	100	90	North Carolina	88	94	97
District of Columbia	100	100	100	North Dakota	94	94	96
Florida	93	92	99	Ohio	98	89	100
Georgia	81	92	98	Oklahoma	98	99	94
Hawaii	100	100	100	Oregon	99	91	98
Idaho	97	96	94	Pennsylvania	84	94	90
Illinois	93	92	93	Rhode Island	100	92	100
Indiana	98	96	89	South Carolina	84	93	94
Iowa	90	98	92	South Dakota	97	98	96
Kansas	85	99	94	Tennessee	92	100	97
Kentucky	87	92	99	Texas	90	95	97
Louisiana	92	90	89	Utah	97	96	96
Maine	88	92	96	Vermont	99	87	99
Maryland	88	88	83	Virginia	91	91	88
Massachusetts	84	94	97	Washington	81	97	98
Michigan	97	90	97	West Virginia	87	98	96
Minnesota	87	92	90	Wisconsin	85	96	91
Mississippi	93	97	98	Wyoming	93	96	85
Missouri	92	94	98				

*The basic weight is used to reflect the probability of selection.
SOURCES: NCES (1991c); Gruber et al. (1993, 1996).

Table 4-3.—TDSS weighted response rates for private schools, by association group: Rounds 1-3

Association group	Weighted response rate (percent)[1]		
	Round 1 (1987-88)	Round 2[2] (1990-91)	Round 3[2] (1993-94)
Total, area frame and list frame	70	84	83
Area sample	49	74	71
Association list frame	—	—	84
Association of Military Colleges and Schools of U.S.	92	91	96
National Catholic Education Association, Jesuit Secondary Education Association	84	91	89
Friends Council on Education	78	91	80
National Association of Episcopal Schools	66	89	78
National Society of Hebrew Day Schools	53	71	79
Solomon Schechter Day Schools		85	88
Other Jewish		70	72
Lutheran Church - Missouri Synod	83	96	91
Evangelical Lutheran Church - Wisconsin		98	90
Evangelical Lutheran Church in America		96	95
Other Lutheran		94	88
General Conference of Seventh Day Adventists	72	94	89
Christian Schools International	89	94	69
American Association of Christian Schools	39	59	73
National Association of Private Schools for Exceptional Children	65	87	89
American Montessori Society Schools, other Montessori	74	86	83
National Association of Independent Schools	64	85	82
National Independent Private School Association	‡	‡	80
Other private schools	55	81	79

—Not available. (Data were not collected or not reported.)
‡Not applicable. (Not listed as a separate association group.)
[1]The basic weight is used to reflect the probability of selection.
[2]Rates for Rounds 2 and 3 are rates for private schools since the TDSS questions were included in the private school questionnaire for these rounds.
SOURCES: NCES (1991c); Gruber et al. (1993, 1996).

about 94 percent, compared with 84 percent for the private School Survey questionnaire (which included the teacher demand and shortage items). Thus, the gap between the public and private

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school sectors narrowed considerably. For both sectors, the response rates increased between Rounds 1 and 2, despite an anticipated decline because of an overlap in schools across rounds. In fact, in Round 2 the response rate for overlap LEAs (those that had been in the sample in Round 1) was about the same as the rate for nonoverlap LEAs. In Round 3, both the weighted TDSS response rates and the gap between public and private schools remained about the same as in Round 2.

The higher response rates in later rounds may have been due, in part, to the elimination of the troublesome matrix items on FTE teachers and positions. Additionally, combining the School Survey and TDSS questionnaires for private schools probably contributed to the higher response rate for such schools. For private schools in Round 1, when separate questionnaires were used, the response to the School Survey questionnaire was higher than the response to the TDSS questionnaire (79 percent vs. 66 percent).

Table 4-2 shows the considerable variation in weighted response rates by state within the public sector. In Round 1, 18 states had weighted LEA response rates of 95 percent or better and only 1, Connecticut, had a rate as low as 61 percent. In Round 2, 7 more states than in Round 1 had weighted response rates of 95 percent or better and, as before, Connecticut had the lowest rate (77 percent). Round 3 saw 27 states achieve a response rate of 95 percent or more, and only 1 state, New Jersey, recorded a response rate below 80 percent; Connecticut, which had the lowest response rate in the previous two rounds, achieved a rate of 94 percent.

As pointed out in chapter 2, in assessing the variation in response rates among the association groups in table 4-3, account needs to be taken of the small sample sizes for many of the association groups. The table shows that the improvement in response rates that occurred between Round 1 and the later rounds applied across all association groups and also for the area frame component. However, the rates in 7 groups dropped by at least 5 percentage points between Rounds 2 and 3, including a drop of 25 percent for the Christian Schools International Association Group. In all rounds, the response rates for the area frame component were lower than those for the list frame.

As with the other SASS components, in Rounds 2 and 3 studies were carried out to examine possible variation in response rates to the TDSS across different types of LEAs (Scheuren, et al., 1996; Monaco, Salvucci, Zhang, Hu, and Gruber, 1998). (The corresponding analyses for private schools are reported in chapter 2 since the items for the TDSS were incorporated into the School Survey questionnaire for these rounds.) Some results from these studies are presented in table 4-4.

Significance tests of differences in response rates across the categories of the characteristics displayed in table 4-4 were conducted for only four characteristics—number of schools in the LEA, student enrollment, urbanicity, and region—in Round 2. These tests were multiple comparison tests of differences between categories, using a Bonferroni adjustment and a 10 percent significance level. Significant differences between at least one pair of categories were found for three of the four characteristics. Significance tests were applied to all six characteristics in Round 3, using an overall significance test (Rao-Scott chi-squared statistic).

Table 4-4.—Weighted response rates for local education agencies, by selected characteristics: Rounds 2 and 3

Characteristics	Weighted response rate (percent)[1]	
	Round 2 (1990-91)	Round 3 (1993-94)
Number of schools:		
0-5	94	95
6+	93	91
	NS[2]	P<0.001
Student enrollment:		
0-299	92	95
300-599	95	95
600-999	94	95
1000-2499	95	95
2500-4999	94	92
5000-9999	93	90
10000-24999	94	91
25000+	89	89
	S[3]	P=0.001
Urbanicity:		
Outside of MSA	94	95
MSA not central city	92	93
MSA central city	92	93
	S[3]	P=0.037
Region:		
West	93	94
South	95	96
Northeast	91	91
Midwest	94	95
	S[3]	P<0.001
Large LEA[4]:		
Yes	‡	89
No	‡	94
		P<0.001
LEA sampled in 1990-91:		
Yes	‡	94
No	‡	94
		P=0.774

‡Not applicable.
[1]The basic weight is used to reflect the probability of selection.
[2]NS indicates there are no significant differences at the 10 percent significance level.
[3]S indicates a significant difference between the response rates for at least some of the levels of the variable at the 10 percent significance level.
[4]A large LEA is a LEA that was sampled with certainty and also that nonresponse for the sampled unit would have a major effect upon its state estimates.
SOURCES: Scheuren et al. (1996); Monaco et al. (1998).

The tests showed significant differences at a 5 percent significance level across categories for all the characteristics with the exception of whether or not the LEA had been sampled in 1990-91. The pattern of significance was the same for Rounds 2 and 3, with the exception of the characteristic "Number of schools," for which there was no significant difference in Round 2 but

a highly significant difference in Round 3. Most of the category differences in response rates are not large. In both survey rounds, higher response rates were found for LEAs outside of an MSA, and lower response rates were found for LEAs in the Northeast and for LEAs with large student enrollments. In Round 3, LEAs classified as large had lower response rates than those not classified as large.

Item nonresponse. Table 4-5 summarizes item response rates for all three survey rounds of the TDSS. The minimum item response rate was 40 percent for the public TDSS in Round 1; 12 percent of the items had response rates less than 75 percent, and 74 percent had response rates of at least 90 percent. For the private sector component, the minimum item response rate was 16 percent, 18 percent of items had rates of less than 75 percent, and 70 percent of items had response rates of 90 percent or more. Most of the items with low response rates in Round 1 were associated with the two matrix items on FTE teachers and positions by field of assignment. Because of the low response rates and other indications of poor quality, no data based on these two questionnaire items were published and they were not included in the survey data files.

Table 4-5.—Percent of items with selected response rates for the Teacher Demand and Shortage Survey, by sector: Rounds 1-3

Sector	Percent of items with response rate: ≥ 90 percent	Percent of items with response rate: < 75 percent	Minimum of item response rate (percent)
Round 1 (1987-88)			
Public	74	12	40
Private	70	18	16
Round 2 (1990-91)			
Public	90	0	85
Private	—	—	—
Round 3 (1993-94)			
Public	91	1	67
Private	—	—	—

—Not available. (For the private sector in Rounds 2 and 3, the TDSS questions were included on the private school questionnaire. The unweighted item response rates in table 2-15 include the rates for the private sector TDSS questions.)
SOURCES: NCES (1991c); Gruber, Rohr, and Fondelier (1993, 1996).

In Round 2, which did not include these items, the overall level of item response was substantially improved. For LEAs, the item response rates varied between 85 and 100 percent, with 90 percent of items having response rates of 90 percent or better. No items had response rates less than 75 percent for the LEAs.

In Round 3, apart from one item, the LEA item response rates ranged from 83 percent to 100 percent. The exception was an item that asked whether the high school graduation requirements reflected a 3- or 4-year program; it had a response rate of 67 percent. Ninety-one percent of the items had response rates greater than 90 percent, with the majority of those above 95 percent.

4.9 ESTIMATION

Imputation. Items that were missing or failed range or consistency checks were imputed at various stages of processing in the same manner in Rounds 1 and 2. In the first stage of computer imputation, missing values were imputed using information about the LEA from other items on the same questionnaire, from data for the LEA from the CCD frame and, if all of the schools in an LEA had been included in the sample, from the School Survey questionnaires for those schools. For items that could not be completed in the first stage, a hot deck procedure based on responses for other LEAs with similar characteristics was used at the second stage. Imputation flags were assigned to imputed values.

In Round 3, imputation consisted of three stages of which the first two were the same as in the previous rounds. As part of the stage 1 imputation, ratio adjustments were applied to two sets of questions: enrollment and numbers of part-time and full-time teachers. For records where the sum of "students by race/ethnicity" entries did not equal the LEA's total enrollment, the "students by race/ethnicity" entries were ratio adjusted so that their sum would equal the total enrollment value. The "teachers by race/ethnicity" entries were similarly handled. For the "students by race/ethnicity" question that consisted of five subquestion items, ratio adjustments were made for between 22 and 30 percent of the subquestion entries. For the "teachers by race/ethnicity" question, between 5 and 10 percent of the five subquestion items were ratio adjusted. Other stage 1 methods assigned values for very small percents of values. Stage 2 hot deck imputation methods assigned values for from less than 1 percent of responses for several variables, to as high as 33 percent for a question asking whether the high school graduation requirements reflected a 3 or 4 year program. For most items, the extent of imputation for this stage ranged between 1 and 6 percent. The third stage of imputation consisted of clerical imputation for an item that had fewer than 10 missing responses and for one or two cases for some other items.

Imputation flags were included on the data file in Round 3 as in previous rounds, but the range of flag values was extended to indicate the type of imputation, if applicable (ratio adjustment, another type of stage 1 imputation, stage 2 imputation, clerical imputation). In earlier rounds, the flags distinguished only between imputed and nonimputed values.

Weighting. Because of the method used to select the sample of LEAs, calculation of the basic sampling weights for LEAs was somewhat more complex than it was for schools, school principals, and teachers. Three types of LEA need to be distinguished:

- All LEAs in Delaware, Nevada, and West Virginia were selected with certainty in all three rounds. Hence their basic weight is 1.

- LEAs that operated a school or schools were selected if one or more of their schools were sampled for the School Survey. The schools were sampled from a stratified design with six strata. The basic weight assigned to a sampled LEA that operated schools was therefore the inverse of one minus the product of the probabilities that no school operated by the LEA was selected from any of the six strata (see Kaufman (1991), Kaufman and Huang (1993), and Abramson et al. (1996) and section 2.4.1).

- LEAs that did not operate schools were sampled at the rate of 1 in 10 in Round 2 and 1 in 6 in Round 3. Hence their basic weights were 10 and 6 in Rounds 2 and 3 respectively. In Round 1, such LEAs were divided into two sets: those with teacher counts available on the frame were sampled with probabilities proportional to the square root of their numbers of teachers, and those without teacher counts were sampled at a rate of 1 in 20. Sampled LEAs from the former set were assigned basic weights that were inversely proportional to the square roots of their numbers of teachers. Those in the latter set were assigned basic weights of 20.

The LEA basic weights were adjusted by similar adjustments to those described for schools in section 2.7.4. These were a sampling adjustment factor, a noninterview factor, and a ratio adjustment factor that benchmarks the estimated numbers of LEAs to known frame totals. The sampling adjustment factor adjusts for unusual circumstances affecting the LEA's probability of selection, such as a merger with another LEA or an LEA split or duplicate listings of the LEA in the sampling frame. The definitions of adjustment cells and the collapsing rules for the nonresponse and frame ratio adjustment factors were similar to those used in the School Survey. When assessing the collapsing of cells for frame ratio adjustments in Round 3, it was found that collapsing had a large impact on the estimates for California, Pennsylvania, and Maine. Collapsing criteria were modified in these cases to reduce the impact on the final estimates.

Variance estimation. As described in section 2.7, a balanced half-sample replication (BHR) procedure was used to estimate sampling errors for all SASS surveys in both Rounds 1 and 2. To reflect the fact that LEAs were selected through the school sample, the LEA replicates were formed using the corresponding school replicates. An LEA was placed into an LEA replicate if any of the sample schools associated with the LEA had been included in the corresponding school replicate. LEAs that had been selected with certainty were included in all replicates, and a separate procedure was used to assign sample LEAs with no schools to replicates. See Kaufman (1991), Kaufman and Huang (1993), and Abramson et al. (1996) for more detail.

In Round 1, sample schools from responding noncertainty LEAs were assigned to a variance stratum/half-sample using the school procedure. If there was only one sample school in an LEA and the LEA contains only one school, the LEA received the school's set of 48 replicate weights. If there was more than one school, the LEA fell into a given replicate if any of its schools fell into the replicate. Replicate weights for LEAs were recalculated using the procedures described in the weighting section, with the exception that the probability of the LEA being selected in a given school stratum was divided by two. Certainty LEAs had replicate weights of 1 and were placed in all replicates. Replicate weights for use in estimating sampling errors by this procedure are included on all microdata files, so that users of these files can estimate sampling errors for items of interest to them.

As in Round 1, the majority of LEAs in Round 2 were selected through the sample of schools, and the 48 half-sample replicates for these LEAs were formed using the corresponding school replicates, following the procedures described for Round 1. A separate procedure was used to assign sample LEAs with no schools to replicates. LEAs without schools were sorted by order of selection. Pairs of LEAs were then systematically placed into consecutive variance strata and each element of a variance stratum was assigned to alternating half-samples. After variance strata were assigned, an orthogonal matrix was used to form the 48 replicates.

As mentioned in previous chapters, the BHR variance estimation procedure assumes sampling with replacement, whereas sampling without replacement is used for all of the SASS surveys. Violation of the replacement assumption leads BHR to overestimate the true variances, but the effects should be small unless the sampling fractions are quite large (Kaufman, 1991). However, for some states, the proportion of LEAs sampled is large, so substantial overestimates of variance are likely to occur for the public TDSS estimates for these states.

The public TDSS is different from the other SASS surveys in that its unit for data collection and analysis, the LEA, is an aggregate of the sampling units, which are schools. This sample design leads to possible violation of a second assumption that is implicit in the BHR method of variance estimation, namely that the true variance is inversely proportional to the sample size. Kaufman (1992, 1993, 1994) undertook a series of simulation experiments to determine the extent of bias for the BHR variance estimation procedures and to evaluate some alternatives. One finding was that the BHR variance estimates for the public TDSS for Rounds 1 and 2 were substantial overestimates. The extent of overestimation varied by state; for some states confidence intervals based on estimates plus or minus one standard error covered the corresponding population values more than 90 percent of the time (if the variance estimates were unbiased, this should happen about 68 percent of the time).

One of the simulation experiments evaluated two different weighting procedures: the one used, in which the sampling weight for each LEA is the inverse of its selection probability, and an alternative "expected hits" weighting procedure, in which the weights are based on the selection probabilities of the sample schools within the selected LEAs. The alternative weighting procedure satisfies the second of the two assumptions of the BHR method of variance estimation and, therefore, should produce unbiased estimates of variances, using the BHR method, if sampling were done with replacement. This proved to be the case. However, for averages and ratios, the estimates based on expected hit weights had larger variances than those based on probability weights, so a change in the weighting scheme was not deemed advisable.

The same study also evaluated two different methods of variance estimation: the BHR and the bootstrap method. Using the bootstrap approach did not affect the ability of users to compute variances using any BHR program without modification (Kaufman, 1993, 1994). Accordingly, for Round 3 SASS surveys, including the TDSS, a bootstrap variance estimator was implemented. Bootstrap replicate weights for LEAs were developed as they were for schools.

Tables 4-6 and 4-7 present coefficients of variation (CVs) for selected estimates from Round 3 of the TDSS. The CV is computed as the standard error of an estimate divided by the estimate, and the standard error is computed using the bootstrap method described above. The CVs for the percent of an LEA's FTE teacher count who are continuing teachers and newly hired teachers are all small, 0.5 percent or less for continuing teachers and 7 percent or less for newly hired teachers (the latter CVs being larger because of the small percent of newly hired teachers). Table 4-7 presents estimates and CVs for teacher salary schedules based on education and experience. Almost all CVs are below 2 percent.

Table 4-6.—Coefficients of variation (CVs) for the percents of full-time equivalent (FTE) public school teachers that are continuing and for newly hired public school teachers, by state: Round 3

States	Continuing FTE teachers (percent)	CV (percent)	Newly hired FTE teachers (percent)	CV (percent)
50 states and D.C.	92.1	0.0	7.9	0.5
Alabama	91.9	0.1	8.1	1.2
Alaska	90.7	0.1	9.3	1.4
Arizona	88.9	0.3	11.1	2.7
Arkansas	91.9	0.2	8.1	2.5
California	92.0	0.2	8.0	2.4
Colorado	90.6	0.3	9.4	2.6
Connecticut	94.8	0.2	5.2	2.9
Delaware	93.5	0.0	6.5	0.5
District of Columbia	93.9	0.0	6.1	0.0
Florida	90.3	0.0	9.7	0.3
Georgia	90.0	0.1	10.0	1.3
Hawaii	88.5	0.0	11.5	0.0
Idaho	91.3	0.1	8.7	1.5
Illinois	91.4	0.4	8.6	4.1
Indiana	94.6	0.2	5.4	3.0
Iowa	93.6	0.2	6.4	3.3
Kansas	91.2	0.3	8.8	3.1
Kentucky	93.2	0.1	6.8	2.0
Louisiana	92.1	0.1	7.9	0.9
Maine	93.6	0.3	6.4	4.4
Maryland	91.6	0.0	8.4	3.6
Massachusetts	93.5	0.2	6.5	2.8
Michigan	96.4	0.2	3.6	6.7
Minnesota	91.0	0.4	9.0	4.1
Mississippi	89.8	0.2	10.2	2.0
Missouri	91.2	0.4	8.8	3.6
Montana	91.1	0.5	8.9	5.4
Nebraska	92.9	0.5	7.1	7.0
Nevada	89.6	0.0	10.4	0.1
New Hampshire	92.2	0.3	7.8	4.0
New Jersey	94.5	0.2	5.5	4.2
New Mexico	87.5	0.1	12.5	0.7
New York	95.5	0.2	4.5	3.1
North Carolina	89.2	0.2	10.8	1.4
North Dakota	93.3	0.4	6.7	5.1
Ohio	94.6	0.2	5.4	3.9
Oklahoma	90.9	0.3	9.1	2.9
Oregon	94.8	0.2	5.2	3.7
Pennsylvania	92.8	0.3	7.2	4.3
Rhode Island	97.1	0.04	2.9	0.7
South Carolina	90.9	0.1	9.1	1.4
South Dakota	92.1	0.2	7.9	2.0
Tennessee	91.7	0.1	8.3	1.3
Texas	88.0	0.2	12.0	1.6
Utah	92.0	0.03	8.0	0.4
Vermont	93.8	0.5	6.2	6.8
Virginia	91.1	0.1	8.9	1.5
Washington	91.6	0.2	8.4	2.0
West Virginia	97.6	0.0	2.5	0.0
Wisconsin	96.1	0.2	4.9	3.1
Wyoming	91.6	0.1	8.4	1.1

SOURCE: CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

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Table 4-7.—Coefficients of variation (CVs) for average public school teacher salary schedules, by earned degree and experience, by state: Round 3

States	Bachelor's and no experience	CV (percent)	Master's plus 30 credits & no experience	CV (percent)	Highest step or salary schedule	CV (percent)
50 states and D.C.	$21,923	0.3	$25,201	0.3	$40,517	0.3
Alabama	22,263	0.2	27,061	0.3	32,840	0.5
Alaska	31,374	0.6	38,165	0.5	58,095	0.5
Arizona	21,890	1.3	25,938	1.3	40,661	1.2
Arkansas	19,603	0.7	22,046	0.7	29,685	0.9
California	24,404	2.0	28,126	1.3	46,272	1.5
Colorado	19,937	0.8	23,491	1.4	37,316	2.7
Connecticut	28,195	1.0	32,379	0.9	56,189	1.7
Delaware	22,914	0.1	28,254	0.1	47,743	0.2
District of Columbia	22,000	0.0	34,000	0.0	54,000	0.0
Florida	21,838	0.3	24,394	0.4	39,599	0.5
Georgia	20,065	0.3	23,899	0.6	42,134	0.4
Hawaii	25,436	0.0	27,352	0.0	49,199	0.0
Idaho	18,102	0.4	22,225	0.6	33,128	1.1
Illinois	21,415	1.4	26,056	1.2	42,004	2.0
Indiana	22,560	0.6	25,100	1.1	41,993	0.6
Iowa	18,796	0.5	22,225	1.0	33,317	6.8
Kansas	22,714	0.6	26,056	0.6	36,671	0.7
Kentucky	21,135	0.3	26,733	0.4	36,743	0.4
Louisiana	18,045	0.7	18,468	0.7	30,539	0.5
Maine	19,566	0.8	21,997	1.1	36,814	0.9
Maryland	24,833	0.2	28,240	0.4	48,158	0.4
Massachusetts	23,108	0.7	26,718	0.6	44,783	0.7
Michigan	24,705	1.0	28,571	1.3	48,315	1.5
Minnesota	21,965	0.5	26,101	1.0	38,638	1.0
Mississippi	19,008	0.1	20,534	0.3	32,693	0.2
Missouri	18,158	0.7	20,779	1.0	28,222	1.8
Montana	17,801	0.4	21,466	1.2	33,755	1.1
Nebraska	17,781	0.7	23,063	1.5	32,281	1.0
Nevada	24,220	0.1	28,910	0.1	44,958	0.2
New Hampshire	21,317	0.8	25,125	1.7	38,971	1.4
New Jersey	28,424	0.8	32,396	1.5	58,208	1.4
New Mexico	22,114	0.1	23,833	0.7	35,994	1.3
New York	27,441	0.9	31,869	1.3	59,116	1.5
North Carolina	20,077	0.1	22,409	0.7	38,733	0.5
North Dakota	16,624	0.5	19,444	0.9	27,371	1.0
Ohio	20,550	0.6	23,832	0.8	42,152	1.0
Oklahoma	22,158	0.2	23,690	0.5	30,445	0.5
Oregon	20,708	0.6	23,719	0.9	35,962	2.0
Pennsylvania	26,341	1.3	29,333	1.6	50,337	1.7
Rhode Island	23,423	0.1	25,701	0.2	46,016	0.2
South Carolina	20,354	0.5	25,375	0.5	41,766	0.6
South Dakota	17,895	0.3	20,131	0.7	27,617	0.8
Tennessee	21,348	0.6	24,754	0.9	34,650	1.6
Texas	19,011	0.6	19,264	0.6	32,358	0.5
Utah	18,740	0.2	21,176	0.4	34,900	0.6
Vermont	20,918	0.7	25,399	0.9	40,330	1.1
Virginia	23,098	0.8	25,074	0.9	38,328	1.3
Washington	21,441	0.1	26,216	0.5	44,892	0.1
West Virginia	21,466	0.0	26,024	0.0	36,678	0.0
Wisconsin	23,080	0.3	27,936	0.8	42,995	0.8
Wyoming	20,137	0.3	24,775	0.3	38,701	0.3

SOURCE: CVs were computed using estimates and standard errors from Bobbitt, Broughman, and Gruber (1995).

4.10 EVALUATION OF ESTIMATES

As noted previously, some school districts in Nebraska that had only elementary schools were found to have been omitted from the Round 1 sampling frame based on the QED file. Consequently, estimated numbers of LEAs, schools, teachers, and students for Nebraska were low in Round 1.

The final Round 2 estimated numbers of LEAs from SASS were compared with two counts from the 1988-89 CCD by state: the total number of LEAs and the number of regular LEAs. These comparisons were complicated by the fact that the character and definitions of LEAs vary by state: some of the nonregular LEAs in the CCD had teachers and were eligible to be included in SASS. For 14 states, the SASS estimate of LEAs differed from the CCD count of regular or total LEAs by 15 percent or more. Estimates for these states were reviewed in detail and in some instances state agencies or LEAs were called to obtain information about the nature of nonregular LEAs. For each of the 14 states, a CCD count of LEAs was determined that came as close as possible to meeting the SASS definition for eligible LEAs, and the SASS estimate was compared with that count. Based on this comparison, the SASS estimate was within 10 percent of the CCD count in 10 of the states and within 15 percent in the remaining 4 states.

Nationally, the SASS estimate of public school teachers, as reported by the LEAs, was 5.9 percent below the CCD count in Round 2. There were 4 states whose SASS estimates were more than 15 percent below the CCD counts: Maryland, Michigan, New Mexico, and Texas. The largest underestimate was for New Mexico, which was 18.6 percent below the CCD count. For enrollment, the U.S. estimate from SASS was 2.7 percent below the CCD count, and there were 3 states—Michigan, Nevada and New Mexico—for which SASS estimates of enrollment were from 10 to 15 percent below the CCD counts. For all other states, SASS estimates were within 10 percent of the CCD figures. Details by state for all of these comparisons are provided in chapter XII of Round 2 *Data File User's Manual* (Gruber et al., 1993).

In Round 3, SASS estimates of the numbers of LEAs by state were compared to the numbers on 1991-92 CCD file, which was the sampling frame for Round 3. Since not all LEAs were considered to be in-scope for SASS, three comparisons were made—one to the total number of LEAs in each state (table 4-8), one to the number of regular LEAs in the state (table 4-8) and one to the adjusted sampling frame (developed at the U.S. Census Bureau in preparation for SASS), which provides a number between the total number of LEAs and the number of regular LEAs (table 4-9). The SASS counts of LEAs were generally closer to the adjusted sampling frame counts, except for Minnesota and Nebraska, where the adjusted sample seemed to make little or no difference. Upon investigation, it was determined that Minnesota had a large number of administrative LEAs, some of which hire teachers. Thus, the adjusted sample number of LEAs is 18 higher than the number of regular LEAs published by CCD. However, the SASS sample underestimated the regular, adjusted sample, and total number of LEAs by 12 percent, 17 percent, and 26 percent, respectively. Several possible explanations were offered. One such explanation was that since the sample of LEAs is dependent upon the sample selected for schools (i.e., schools are the main unit of analysis and districts are associated with the sampled schools); there may be a number of LEAs that are not being represented very well in the overall Minnesota district sample. LEAs included in the frame that do not operate schools are supposed to be

Table 4-8.—Public school districts in SASS, by state, compared with total and regular districts in 1991-92 Public Education Agency Universe (Common Core of Data [CCD]): Round 3

State	CCD total districts	CCD regular districts	SASS districts	SASS/CCD total districts (percent)	SASS/CCD regular districts (percent)
50 states and D.C.	16,661	15,173	14,998	90	99
Alabama	133	129	130	98	101
Alaska	56	56	56	100	100
Arizona	247	229	219	89	96
Arkansas	347	325	311	90	96
California	1,070	1,005	1,062	99	106
Colorado	196	176	183	93	104
Connecticut	179	166	177	99	107
Delaware	22	19	19	86	100
District of Columbia	1	1	1	100	100
Florida	74	69	72	97	104
Georgia	183	183	183	100	100
Hawaii	1	1	1	100	100
Idaho	114	114	114	100	100
Illinois	1,020	942	933	91	99
Indiana	319	296	310	97	105
Iowa	469	435	399	85	92
Kansas	304	304	303	100	100
Kentucky	255	176	174	68	99
Louisiana	83	66	71	86	108
Maine	326	283	236	72	83
Maryland	24	24	24	100	100
Massachusetts	439	352	349	80	99
Michigan	622	561	608	98	108
Minnesota	517	434	383	74	88
Mississippi	171	150	154	90	103
Missouri	544	543	541	99	100
Montana	621	539	523	84	97
Nebraska	895	777	650	73	84
Nevada	18	17	18	100	106
New Hampshire	239	174	163	68	94
New Jersey	620	608	591	95	97
New Mexico	96	88	95	99	108
New York	758	717	724	96	101
North Carolina	135	133	123	91	92
North Dakota	325	276	257	79	93
Ohio	791	613	661	84	108
Oklahoma	593	593	564	95	95
Oregon	308	296	280	91	95
Pennsylvania	611	503	593	97	118
Rhode Island	38	37	37	97	100
South Carolina	95	95	94	99	99
South Dakota	227	189	176	78	93
Tennessee	140	140	139	99	99
Texas	1,051	1,051	1,048	100	100
Utah	47	40	40	85	100
Vermont	339	279	237	70	85
Virginia	161	141	143	89	101
Washington	296	296	296	100	100
West Virginia	55	55	55	100	100
Wisconsin	428	428	428	100	100
Wyoming	58	49	50	86	102

NOTE: Districts that do not operate schools nor hire teachers are out of scope for SASS, although such districts may appear on the CCD frame. These districts, denoted "districts without schools" have been subtracted from the state's weighted estimate of districts whenever those districts were inadvertently retained on the SASS file with a final weight. However, out of 20 unweighted districts without schools on the SASS file with a final weight, 5 are valid. The rest have been subtracted from the states weighted count.
SOURCE: Gruber, Rohr, and Fondelier (1996).

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Table 4-9.—Public school districts in SASS, by state, compared with census-adjusted number of districts in the Public Education Agency Universe (Common Core of Data [CCD]) for 1991-92: Round 3

State	CCD districts (adjusted)	SASS districts	SASS/CCD (percent)
50 states and D.C.	15,472	14,998	97
Alabama	130	130	100
Alaska	56	56	100
Arizona	222	219	99
Arkansas	325	311	96
California	1,067	1,062	100
Colorado	183	183	100
Connecticut	178	177	99
Delaware	19	19	100
District of Columbia	1	1	100
Florida	72	72	100
Georgia	183	183	100
Hawaii	1	1	100
Idaho	114	114	100
Illinois	1,011	933	92
Indiana	311	310	100
Iowa	425	399	94
Kansas	304	303	100
Kentucky	176	174	99
Louisiana	74	71	96
Maine	238	236	99
Maryland	24	24	100
Massachusetts	358	349	97
Michigan	615	608	99
Minnesota	462	383	83
Mississippi	163	154	94
Missouri	541	541	100
Montana	533	523	98
Nebraska	771	650	84
Nevada	18	18	100
New Hampshire	163	163	100
New Jersey	590	591	100
New Mexico	94	95	101
New York	727	724	100
North Carolina	135	123	91
North Dakota	277	257	93
Ohio	661	661	100
Oklahoma	578	564	98
Oregon	295	280	95
Pennsylvania	600	593	99
Rhode Island	38	37	97
South Carolina	95	94	99
South Dakota	176	176	100
Tennessee	139	139	100
Texas	1,050	1,048	100
Utah	40	40	100
Vermont	251	237	94
Virginia	155	143	92
Washington	296	296	100
West Virginia	55	55	100
Wisconsin	428	428	100
Wyoming	54	50	93

SOURCE: Gruber, Rohr, and Fondelier (1996).

sampled at a 10 percent rate, but the particular sample selected in a given year may have fewer than average in-scope LEAs (those that hire teachers), which would keep the estimated number of LEAs lower. Another possible explanation was that Minnesota's response rate was more than 4 percent lower than the national average, and adjustments may not have compensated adequately (Gruber et al., 1996).

Nebraska had a large number of LEAs that do not operate schools, so the valid comparison is to the number of regular public school districts. The adjusted sampling frame count is only 6 districts more than the number of regular districts. In the 1990-91 SASS, there was only a 6 percent difference between the estimated number of districts and the number of regular districts in the CCD. In Round 3, there was a 17 percent difference between the SASS estimated count and the number of regular CCD districts—11 percentage points higher than the same comparison in the previous round. Possible reasons cited for this included Nebraska's higher-than-average out-of-scope rate that reduces the number of eligible districts from the selected sample, and the number of district closings that may have occurred between the sampling year and the year of data collection may be increasing (Nebraska has a large number of one-school districts). Adjustments may not have been able to compensate for such occurrences (Gruber et al., 1996).

Another comparison made in Round 3 related to the number of FTE teachers per state as estimated from the TDSS and CCD's State Nonfiscal Survey (Johnson, 1995). Table 4-10 shows that the TDSS estimate of the numbers of FTE teachers was less than 1 percent lower overall than CCDs. Estimates for 11 states were at least 5 percent higher, with Alaska's and Pennsylvania's estimates being 10 percent higher. On the other hand, four states had estimates that were less than 90 percent of CCD's number of FTE teachers. A possible explanation for TDSS undercounts in some states is that large LEAs have higher nonresponse rates for which the nonresponse adjustments do not fully compensate. Possible explanations for TDSS overcounts include the possibilities that some LEAs may report headcounts rather than FTEs and some may report teachers covered by other districts (e.g., teachers who have been "lent out" to other districts) (Gruber et al., 1996).

Table 4-10.—Full-time equivalent (FTE) teachers in SASS, by state, compared with 1993-94 Common Core of Data (CCD): Round 3

State	FTE teachers CCD	FTE teachers SASS	SASS/CCD (percent)
50 states and D.C.	2,505,074	2,501,112	100
Alabama	43,002	44,468	103
Alaska	7,193	7,886	110
Arizona	37,493	39,334	105
Arkansas	26,014	27,771	107
California	221,779	215,044	97
Colorado	33,661	29,004	86
Connecticut	34,526	35,142	102
Delaware	6,380	6,555	103
District of Columbia	6,056	6,056	100
Florida	110,653	116,299	105
Georgia	75,602	74,405	98
Hawaii	10,111	10,300	102
Idaho	12,007	12,130	101
Illinois	110,874	89,862	81
Indiana	55,107	56,469	102
Iowa	31,616	32,120	102
Kansas	30,283	29,345	97
Kentucky	37,324	40,285	108
Louisiana	46,913	46,398	99
Maine	15,344	16,384	107
Maryland	44,171	43,627	99
Massachusetts	58,766	59,665	102
Michigan	80,267	80,674	101
Minnesota	46,956	42,271	90
Mississippi	28,376	29,321	103
Missouri	54,543	55,093	101
Montana	9,950	10,866	109
Nebraska	19,552	16,721	86
Nevada	12,579	12,177	97
New Hampshire	11,972	11,821	99
New Jersey	84,564	84,436	100
New Mexico	18,404	18,013	98
New York	179,413	181,499	101
North Carolina	69,421	66,259	95
North Dakota	7,755	8,100	104
Ohio	107,444	107,609	100
Oklahoma	39,031	39,269	101
Oregon	26,488	23,209	88
Pennsylvania	101,301	111,711	110
Rhode Island	9,823	10,329	105
South Carolina	38,620	39,363	102
South Dakota	9,557	9,343	98
Tennessee	46,066	48,148	105
Texas	224,830	231,393	103
Utah	19,053	20,320	107
Vermont	8,102	7,641	94
Virginia	70,220	65,637	93
Washington	45,524	47,036	103
West Virginia	21,029	20,718	99
Wisconsin	52,822	56,887	108
Wyoming	6,537	6,701	103

SOURCE: Gruber, Rohr, and Fondelier (1996).

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5. THE TEACHER SURVEY

5.1 INTRODUCTION

The Teacher Survey collects data from a sample of classroom teachers in schools sampled in the School Survey. Data for teachers are collected for the same school year as for the schools (i.e., 1987-88 for Round 1 of the Schools and Staffing Surveys (SASS), 1990-91 for Round 2, 1993-94 for Round 3, and 1999-00 for Round 4). Sample schools in the School Survey are asked to provide lists of teachers who were teaching at the school at the start of the survey reference year. Between 1 and 20 teachers are sampled from the list for each eligible school that provides a list, yielding an overall sample size in excess of 65,000 teachers at each round. Questionnaires are mailed to sample teachers at their schools, and nonrespondents are followed up with telephone interviews at school.

The Teacher Survey collects data from teachers about current teaching status and work load, past teaching experience, education and training, perceptions and attitudes toward teaching, incentives and compensation, and demographic characteristics. The teacher questionnaire consists of four different forms for teachers in different types of schools: public schools, private schools, Bureau of Indian Affairs (BIA) schools (Rounds 3 and 4), and charter schools (Round 4). The four versions of the questionnaires are virtually identical and include tracing information needed to locate teachers for the Teacher Followup Survey, which is conducted in the year after the Teacher Survey. Those eligible for selection for the Teacher Followup Survey include all sample teachers who responded to the Teacher Survey (see chapter 6).

This chapter discusses the definition of teachers in the survey population for the Teacher Survey (5.2), sample design considerations (5.3), the teacher sample, including the use of teacher lists from sample schools in the School Survey as the sampling frame (5.4); questionnaire contents (5.5); data collection procedures, measurement error studies, and nonresponse (5.6); data processing and estimation (5.7); and evaluation of estimates (5.8).

5.2 DEFINITION OF TEACHERS

The target population for the SASS Teacher Survey consists of regular full-time and part-time teachers whose primary assignment is teaching in kindergarten or any of the grades 1 to 12 in a school that is in-scope for the School Survey (see section 2.2). Also included are long-term substitutes who are filling the role of a regular teacher on a long-term basis and itinerant teachers (those teaching regularly in more than one school).

Beginning in Round 3, the definition has been extended to anyone who teaches grades K-12 including persons whose primary assignment was not teaching. With this change, school principals who also teach are eligible for the teacher sample. If selected, they would receive a teacher questionnaire in addition to receiving a school principal questionnaire (see chapter 3).

The survey population is determined by the operational procedures for the survey. The list frame of teachers within sample schools is compiled in the fall of the reference year. Teachers sampled from the lists are contacted later, starting in January in Rounds 1 and 2 and in December in

Round 3. Only teachers who remain at the schools at which they were sampled are treated as in-scope. Thus the survey population comprises teachers who were present at the beginning of the school reference year and who are still at the schools when the data collection for the Teacher Survey takes place. The survey population thus excludes teachers who left between the compilation of the list and data collection, those who joined the schools in that period or at any other time in the school year, and teachers who joined newly created schools.

In each round, schools provided information on the teacher listing forms. This information was used to classify the eligible teachers into the following types:

- *New teachers*—those in their first, second, and third year of teaching; all others are classified as experienced teachers.

- *Bilingual/English as a Second Language (ESL) teachers*—those who use a language other than English to instruct students with limited English proficiency; or teachers providing intensive instruction in English to students with limited English proficiency.

- *Asian or Pacific Islander (API) and American Indian, Aleut, or Eskimo (AIAE) teachers*—those indicated on the teacher listing form as API or AIAE.

Ineligible persons. Teachers in schools ineligible for the School Survey are ineligible for the Teacher Survey (see section 2.2 for the definition of eligible schools). Also excluded from the Teacher Survey are short-term substitutes, teacher's aides, student teachers, other nonteaching professionals (e.g., guidance counselor, librarian, nurse, psychologist), support staff (e.g., cook, custodian, bus driver, dietician, secretary), and in Rounds 1 and 2, school administrators (e.g., principal, assistant principal).

Persons ineligible for the Teacher Survey could be screened out at three points in the data collection. First, the instructions state that they should be excluded from the teacher lists requested from the sample schools for use in selecting the teacher sample. Second, any person who had been incorrectly included on a school's teacher list and sampled could be identified by the first item on the Teacher Survey questionnaire, which asks for the respondent's main assignment at the school during the school year. Respondents in categories that make them ineligible for the Teacher Survey (e.g., student teachers) are instructed to mail back their questionnaires without completing the remaining items. Finally, if a completed questionnaire is returned for an ineligible person, it would normally be classified as out of scope in the interview status edit (see section 5.7).

5.3 SAMPLE DESIGN GOALS

This section briefly outlines the considerations for each of the four goals that have guided the design of the Teacher Survey: providing estimates of acceptable precision for specified domains; placing limits on the number of teachers selected from each sample school; making the sample approximately self-weighting within each of the main domains; and ensuring that the target sample sizes would be achieved for bilingual, API, and AIAE teachers.

Domains. The Teacher Survey is designed to provide estimates of adequate precision for the following domains:

- Experienced and new teachers separately in public elementary and secondary schools by state, in public combined schools, in BIA and Native American schools (since Round 2), and in charter schools (Round 4 only); in private schools by association group categories, school level, and census region;
- Bilingual/ESL teachers (separately for California, Texas, Florida, Illinois, New York, and all other states in Round 1); and
- API and AIAE teachers (since Round 2).

To provide estimates of acceptable precision for these domains requires oversampling of bilingual, API, AIAE teachers, and new teachers in private schools relative to other groups. At each round, the sample sizes of new teachers in private schools were determined to ensure that there would be sufficient numbers of new teachers in both the Teacher Survey and the Teacher Followup Survey. New teachers in public schools required no oversampling. Section 5.4 describes the methods used to sample the teachers for the Teachers Survey.

Placing limits on the number of teachers to sample per school. The sample design specified that at least one teacher be selected from every sample school. The number of teachers to be selected from a school was not allowed to exceed 20. This limit was imposed to avoid overburdening schools with a large teacher sample.

Making the sample approximately self-weighting within each of the main analytical domains. This goal was accomplished by using within-school sampling fractions for selection of teachers that, when multiplied by the schools' selection probabilities, would produce approximately the same teacher selection probabilities for all schools in a domain or stratum, for example, public elementary schools in a state. It was expected that this design would be close to optimum with regard to the sampling errors of estimates for each domain. A completely self-weighting sample of teacher was not possible given the limits on teacher sample size per school discussed above.

Ensuring the target sample sizes of bilingual, API, and AIAE teachers. The procedures to ensure the target sample sizes of bilingual, API, and AIAE were somewhat different in each round. In Rounds 1 and 2, there were no reliable estimates for the numbers of bilingual, API, and AIAE teachers in advance of sampling. Since the sampling of teachers was done on a flow basis in these two rounds as the lists of teachers came in from sample schools, estimates of the total numbers of teachers in these groups could not be made using all the teacher lists.

To address this problem, Round 1 used initial sampling fractions expected to produce a larger than needed sample of bilingual teachers (API and AIAE teachers were not oversampled in this round). As data collection proceeded, estimates of the expected final sample sizes were developed and a sampling reduction rate was determined and applied to the overall sample to provide the desired sample sizes (see Kaufman, 1991).

Round 2 also used conservative sampling fractions initially to select larger than needed samples of bilingual, API, and AIAE teachers. The selected samples were randomly assigned into 101 equal size "reduction groups," and then reduction groups were deleted as needed to achieve the target sample size for each group of teachers.

Round 3 used a different sampling procedure that was applied in three stages. The early returns of teacher lists from sample schools were combined into a single list and sorted by types of teacher, thus providing a count of teachers by type. The sampling fraction was then determined to yield the desired sample size. This procedure was repeated with the next batch of returns and again with a final batch.

5.4 SELECTING THE TEACHER SAMPLES

Since the sampling procedures for teachers from schools in the public and private sectors are similar, they will be described together, with differences noted where they exist. This section discusses the collection of teacher lists from sample schools to use as the sampling frame for teachers (5.4.1), teacher samples and sample sizes (5.4.2), and coverage and frame quality issues (5.4.3). The Sample Design and Estimation reports for the three rounds (Kaufman, 1991; Kaufman and Huang, 1993; and Abramson et al., 1996) provide further details of the sampling procedures.

5.4.1 Teacher list collection

Teacher lists were requested from all schools sampled for the School Survey. The listing forms were mailed with the advance letters to schools in the fall of the survey reference year (see table 1-2 for the mailing schedule in each round). School principals or other school staff completed the forms and returned them in a postage-paid envelope. The listing forms contained instructions for listing eligible teachers, and schools were asked to record each teacher's first and last name, teaching experience, race/ethnicity, participation in bilingual/ESL programs, and teaching specialty by level.

In Rounds 1 and 2, U.S. Census Bureau field representatives started making telephone calls to sample schools that had not returned the teacher listing forms about 4 weeks after the mailing. They asked the schools (in order of preference) to mail in the completed listing form, to mail in a list of teachers, or to give the list of teachers over the telephone. If a school objected to providing a complete list of teachers, the school was given the option to select a sample of teachers as instructed by the field representative and to provide information for the selected teachers over the telephone. Some schools that selected their own samples objected to providing the names of sample teachers; these schools were asked to label the ones they had selected as T1, T2, T3, etc. The questionnaires for these teachers were subsequently mailed to the contact person for the sample school labeled with these identifiers (U.S. Census Bureau, 1990). In Round 2, this procedure was used for about 1 percent of the public schools and about 3 percent of the private schools. This option was not used in Round 3.

Round 3 used a slightly different data collection procedure, a new listing form, and a toll-free number for schools to call for assistance if necessary. One week after the first mailing, a reminder postcard was sent to all sample schools. About 3 weeks after the postcard, a second

listing form was mailed to schools that had not returned the lists (about 60 percent of the sample schools). Census field representatives began calling schools that had not returned the listing forms about 4 weeks after the second mailing. Telephone followups ended in mid-December, about the same time as in previous rounds.

5.4.2 The teacher samples

Round 1. The Round 1 teacher sample used a different selection procedure from that used in subsequent rounds. The Round 1 teacher sample consisted of a basic sample of new and experienced teachers and a supplemental sample of bilingual teachers selected independently of the basic sample. For the basic sample, the within-school teacher allocation involved the following steps:

(1) *Determine the total numbers of teachers to be selected from the lists provided by the sample schools.* These numbers were chosen according to a formula that satisfied two requirements: (a) to make the product of the school's selection probability and the sampling fraction for teachers within the school constant within each school stratum; and (b) to make the average number of teachers selected from schools in that stratum equal to a target number established for schools of that sector (public or private) and level (elementary, secondary, or combined). After this calculation, constraints were placed to sample at least one teacher per school and no more than twice the target average number of teachers for the sector and school level stratum. The target average number of teachers varied by sector and school level, ranging from an average of about three teachers for public elementary and private combined schools to an average of about seven teachers for public secondary schools.

(2) *Allocate the sample for each school between new and experienced teachers.* In public schools, new and experienced teachers were allocated in proportion to the number of teachers of each type, as determined from the teacher listing forms. In private schools, new teachers were oversampled relative to experienced teachers by a fixed factor of 1.6. The oversampling ensured a sufficiently large sample of new private school teachers in both the Teacher Survey and the subsequent Teacher Followup Survey.

For each school, teachers were first sorted into new and experienced teachers and then by primary field of teaching as reported on the listing form. For elementary school teachers, the fields were general elementary, special education, or other teaching assignment. For secondary school teachers, they were mathematics, science, English, social studies, vocational education, or other teaching assignment. For combined schools, teachers were sorted by grade level and then by the corresponding fields for elementary or secondary teachers. Following the sorting operation, a systematic sample of teachers was selected with equal probability within the groups of new and experienced teachers at the rate determined for that group in the school.

The Round 1 supplemental bilingual teacher sample was selected independently from the basic sample. The supplemental sample was designed so that the sample size for bilingual teachers from the basic sample and supplementary sample combined would be sufficient to provide separate estimates for California, Texas, Florida, Illinois, New York, and all other states as a group. Within each school, teachers were sorted into new and experienced teacher groups and then by primary field of teaching. The supplemental sample was selected by systematic

sampling. To avoid overburdening schools, if the sum of the basic and bilingual teacher samples was greater than 20 in any school, the bilingual sample was systematically reduced to make the total teacher sample equal to 20.

Round 2. In Round 2, teachers on the list from each sample school were sorted into one of five teacher groups: API, AIAE, bilingual, new, and experienced. Teachers falling in more than one of these categories were placed in the first group listed. For example, an Asian bilingual teacher would be allocated to the API stratum. Teachers within each school and teacher group stratum were sort by primary field of teaching as in Round 1 and a systematic sample of teachers was selected with equal probability at the rate determined for that group. In private schools, new teachers were oversampled relative to experienced teachers by a factor of 1.8. As in Round 1, the number of new and experienced teachers was limited to be no more than twice the target number of teachers for the sector and school level stratum.

Determine the number of bilingual, API, and AIAE teachers to be selected from each school. The numbers of bilingual, API, and AIAE teachers to sample from the list provided by each sample school were determined using a formula similar to that used for new and experienced teachers. The first requirement was to make the product of the school's selection probability and the sampling fraction for teachers within the school constant within each school stratum. The second requirement was to meet the target sample size desired for the group. The difficulty in estimating the national sampling intervals for these groups of teachers and the sample reduction approach used to handle this problem were outlined in section 5.3. When the combined sample of new, experienced, API, AIAE, and bilingual teachers exceeded 20 in a school, the API, AIAE, and bilingual teachers were proportionally reduced to meet the maximum requirement.

Round 3. In Rounds 1 and 2, the teacher samples were selected separately for each sample school. To give greater control on the sampling process—particularly for API, AIAE, and bilingual teachers—Round 3 teachers were sampled from combined lists of teachers for sets of schools. Sampling was conducted in three waves: in mid-December, mid-January, and mid-February. The sampling by wave prevented the straggling teacher listing forms from delaying the whole teacher sampling process (Abramson et al., 1996). At the end of the first wave, due to the higher than expected listing form response rate, the projected total sample size was found to be higher than expected. To compensate, the sampling rate was adjusted so that the expected average number of teachers per school was reduced for the subsequent waves of teacher sampling.

The teacher list frames for each of the three waves were sorted by school strata and, within each stratum, by school order of selection. Within schools, teachers were sorted by the five teacher strata and by primary fields of teaching, as in Round 2. Within each school and teacher stratum, teachers were selected systematically throughout the stratum across schools to produce an overall equal probability sample of teachers for that stratum.

Sample size. Table 5-1 shows the numbers of teachers in the samples for Rounds 1 to 3. The sample in each round is in excess of 65,000 teachers. The numbers of new and experienced teachers for Round 1 include bilingual, API, and AIAE categories who were counted in separate

Table 5-1.—Sampled teachers for the Teacher Survey, by type: Rounds 1-3

Teacher groups	Sample sizes		
	Round 1* (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	67,771	65,217	68,284
Experienced	58,275	52,084	55,789
New: Public schools	6,633	5,970	4,799
Private schools	2,863	2,002	2,182
Bilingual	3,129	2,121	2,118
American Indian, Aleut or Eskimo (AIAE)	‡	1,529	1,661
Asian or Pacific Islander (API)	‡	1,511	1,735

*The numbers of new and experienced teachers in Round 1 included bilingual, API, and AIAE teachers.
‡Not applicable. (Not listed as a separate category.)
SOURCES: NCES (1991d); Gruber, Rohr, and Fondelier (1993, 1996).

strata in subsequent rounds. Of the 3,129 bilingual teachers in the Round 1 sample, 682 teachers were selected in the basic sample and 2,447 teachers were added through the bilingual supplement. The sample sizes for new and experienced teachers in Rounds 2 and 3 do not include bilingual, AIAE, and API teachers.

Design effects. As explained in section 2.4, the complex sampling design of SASS produces sampling variances different from those produced by a simple random sample of the same sample size. The impact of the complex design on the reliability of a sample estimate, relative to a simple random sample, can be measured by the design effect (deff). This measure reflects increases in the variances arising from the clustering and departures from an equal probability sample and decreases from the use of stratification and the estimation procedures. A deff larger than 1 indicates that the sampling error is higher than that from a simple random sample of the same size.

Salvucci, Weng, and Kaufman (1995) computed deffs for groups of statistics by characteristics for the Round 2 Teacher Survey. Table 5-2 shows the deffs by sector for groups of statistics on teacher totals (e.g., number of male teachers), teacher averages (e.g., average number of years as a part-time teacher), and teacher proportions (e.g., proportion of married teachers). The average deff for totals is high because one item (number of white teachers) had a very high deff.

5.4.3 Frame coverage and evaluation studies

The coverage of the Teacher Survey depends on the coverage of the sample frame for schools (Quality Education Data [QED] or Common Core of Data [CCD]), which is discussed in section

Table 5-2.—Average design effects for estimates of totals, averages, and proportions, for selected items in the Teacher Survey: Round 2

School sector	Average design effect (deff)*		
	Total	Average	Proportion
Public schools	4.95	3.45	2.84
Private schools	3.32	2.33	1.90
Number of estimates	16	20	23

*Design effects were not available for Rounds 1 and 3.
SOURCE: Salvucci, Weng, and Kaufman (1995)

2.4.3. It then depends on the completeness of the teacher listings provided by sample schools. This section discusses issues of list coverage and evaluation studies to improve the teacher listing forms.

Coverage. Since the teacher listings were prepared early in the school year, only those teachers who were on the school's rolls at that time would have been listed and eligible for sampling. Teachers who joined during the school year are not reflected in the Teacher Survey.

Another issue is that a school's roll of teachers might have included some teachers who were on leave during the initial part of the school year. The instructions for the teacher listing forms did not specify whether or not teachers on leave should be included. The extent of this problem is not known.

Some teachers recorded on a school's listing form had left the school by the time of the Teacher Survey data collection. No attempts were made to obtain completed questionnaires from sampled teachers of this type; they were classified as out of scope.

Teacher list nonresponse. Some sample schools that were eligible for SASS did not provide teacher lists. As a result no teachers from these schools were included in the sample. These teachers are reflected through an adjustment in the teacher weights. For private schools, the list nonresponse rate was 12 percent in Round 1, 10 percent in Round 2, and 9 percent in Round 3. For public schools, the list nonresponse rate ranged between 4 and 5 percent in each round.

Out of scope. Some teachers sampled from the teacher lists were later found to be ineligible for the Teacher Survey (see section 5.2). In Round 2, the out-of-scope rates were 7 percent of the sample teachers in public schools and 12 percent of the sample teachers in private schools (Gruber, 1992b). In Round 3 the corresponding rates were 5 percent for public schools and 10 percent for private schools (Monaco, Salvucci, Zhang, Hu, and Gruber, 1998). Section 5.2 discussed the stages in which an ineligible person can be excluded from the teacher survey.

Discrepant teacher count reported by the school in the School Survey. The count of eligible teachers reported on the school questionnaire was not always the same as the number of teachers recorded on the teacher listing form for that school. In Round 1, in an average state, there were 5 percent fewer teachers recorded on the teacher listing forms than were reported on the school

questionnaires (Kaufman, 1991, p.67). For Rounds 2 and 3 the teacher weights were adjusted to make the estimates of teacher counts from the Teacher Survey consistent with the weighted teacher counts from the School Survey (see section 5.7.3). The values of the adjustment factors by weighting cell indicate that, on average, fewer teachers were recorded on the listing forms than were reported on the school questionnaires.

Frame evaluation studies. The 1993 Teacher Listing Validation Study (Royce and Schreiner, 1994, and Royce, 1995) was undertaken in school year 1992-93 to answer the following three questions: What kinds of problems do schools have in completing the teacher listing forms? For public schools, would the local education agencies (LEAs) be able to provide teacher listings that are more accurate than those prepared by the schools? What is the relative accuracy of teacher counts from the school questionnaires and the teacher listing forms?

The first two questions were investigated with a sample of 300 private schools, 290 public schools, and 254 LEAs (some LEAs had more than one sample school). The third question was addressed through a separate sample of 300 public schools and 290 private schools. All of the schools in these two samples were asked to complete teacher listing forms, and the LEAs in the first sample were asked to complete teacher listing forms for the sample school(s) in their districts. Various techniques involving personal and telephone reinterviews and reconciliation for a subsample of schools were used to investigate the study questions.

The main conclusion was that both public schools and their corresponding LEAs made errors listing teachers. The common errors included omission of part-time and specialized subject-matter teachers, and over-inclusion of some nonteachers (e.g., guidance counselors, speech therapists, and librarians). In general public school listings were found to be more accurate than those of their corresponding LEAs. SASS has therefore continued to ask for teacher lists from the schools. Comparisons of teacher counts from the teacher listing records with those on the school questionnaires suggest that the teacher listing records gave more accurate counts for both public and private schools. Common errors in the teacher counts on the school questionnaires included omissions of part-time teachers and erroneous inclusion of librarians and pre-kindergarten teachers.

As a result of the Teacher Validation Study, the teacher listing form for Round 3 was revised to provide more specific instructions regarding the teachers to include and to exclude. The new form also included a toll-free 800 telephone number, where schools could obtain assistance in completing the form.

In preparation for Round 4, two cognitive studies sought further improvements to the teacher listing form used in Round 3. Jenkins and Von Thurn (1996) interviewed the principals (or persons who would ordinarily be responsible for completing the form) from 19 schools using cognitive study techniques. They found that some instructions on the Round 3 form were not well defined. Based on their results, Zukerberg and Lee (1997) redesigned the teacher listing form and conducted a cognitive study with another 20 schools to evaluate new features proposed for the form. The proposed changes include format changes to ease readability, the use of color to enhance the overall appearance, and better navigation structure. Many of their formatting and style recommendations were adopted after a pretest for Round 4.

5.5 CONTENT OF THE TEACHER QUESTIONNAIRES

The teacher questionnaires covered similar topics in Rounds 1 through 3 but with some minor changes in specific items for each round (see NCES, 1991c; Gruber, Rohr, and Fondelier, 1993, 1996). Each questionnaire included nine sections:

- *Current Teaching Status* collected data on whether the respondent was a full-time or part-time teacher, his/her other duties at the school, and jobs or activities outside of school.
- *Teacher Experience* asked for the year of first teaching experience, the number of breaks in his/her teaching career, and the year in which he/she began teaching in the sample school.
- *Teacher Training* collected data on college degrees, teaching assignment fields, certification, the fields that the respondent felt best qualified to teach, college courses in mathematics and science, participation in in-service training, membership in a teachers' union, and participation in programs for beginning teachers.
- *Current Teaching Load* obtained information on grade levels taught, types and numbers of classes, numbers of students, subjects taught, and number of hours per week spent on job and job-related activities.
- *Perceptions and Attitudes Toward Teaching* collected data on the respondent's attitudes and perceptions about his/her current teaching job and toward teaching in general.
- *Future Plans* inquired about retirement eligibility, how long the teacher planned to remain in teaching, and his/her career plan for the following school year.
- *Incentives and Compensation* obtained data on teaching salary, benefits, and other earned income.
- *Background Information* collected data on gender, race/ethnicity, age, marital status, number of dependents, and family income.
- *Limited-English-Proficient Students* asked about limited-English-proficient students in the teacher's classes.

The contents of the teacher questionnaire can be used to provide measures of teacher quality and teacher qualifications. In a review of various methods for measuring teacher quality and teacher qualifications, Ingersoll (1996) concluded that data from the Teacher Survey can be used to determine several aspects of teacher quality, including teacher's preparation (e.g. ability, education, training, and background), induction (entry, apprenticeship, and mentoring programs for new teachers), utilization (assignment to service chores and out-of-field teaching), compensation (salary), resources (class size, equipment, preparation time, aides), decision-making participation, and personal and professional development opportunities.

A study of methods to measure teacher qualifications by Fabiano (1999) concluded that teachers' self-report data in national surveys such as the Teacher Survey provide the most common and cost-effective way of collecting nationally representative data on teachers and their

qualifications. For validation, the report proposed for consideration that a transcript study be included in the Teacher Followup Survey; this proposal has not been adopted in Round 4.

Forms. In Rounds 1 and 2, there were two separate versions of the teacher questionnaire, one for public school teachers and the other for private school teachers. A third form was added in Round 3 for teachers in BIA schools, and a fourth form was added in Round 4 for teachers in charter schools. The contents of the different forms for each round were nearly identical. In Rounds 2 and 3, different lists of the organizations endorsing the surveys were presented on the front page of the questionnaires. One item, asking whether the teacher was working at the school on a contributed service basis (less than full salary or no salary), was used only for private school teachers' questionnaires. In Round 4, charter school teachers who worked in the school prior to its becoming a charter school were asked if they supported the conversion (NCES, 1999).

Content changes between Rounds 1 and 2. Round 2 reduced the number of perception and attitude items used in Round 1 and added more items on professional activities. An initial item in the perception and attitude section asked teachers about their agreement or disagreement with each of a series of statements relating to their teaching environment; the number of such statements was reduced from 23 in Round 1 to 14 in Round 2. Conversely, for an item asking teachers to evaluate the relative seriousness of various kinds of problems in their school, the number of categories was increased from 13 to 22. A new item asking teachers to rank the relative importance of various educational goals was added in Round 2.

In the teacher training section, items on membership in professional organizations and participation in teacher induction programs (assistance to new teachers by mentor or master teachers) were added in Round 2. In the incentives and compensation section, a Round 1 item on incentives asked, with respect to each of several possible kinds of pay incentives, whether teachers favored them and whether they were receiving them. In Round 2, teachers were asked only to report which ones they were receiving.

Content changes between Rounds 2 and 3. The Round 3 teacher questionnaires added and also deleted several items, based on field test and cognitive studies that evaluated response rates, ambiguities in the item wordings, burden on the respondent, and whether the data were needed for education research. New items included advanced (master's) degree, whether teacher was a Chapter 1 teacher, participation in in-service training, participation in a professional development program, teaching certificates awarded by other states or for fields other than the teacher's primary and secondary teaching assignments, number of tardy students, whether the teacher had been physically attacked by a student, and the year that the teacher would be eligible to retire. Items deleted include levels (elementary, secondary) at which the teacher had ever taught, numbers of college courses taken in teaching methods and in subjects currently taught, whether the teacher received pay incentives, main activity in the previous school year, and other items about students.

Round 4 teacher questionnaires. The 1999-00 teacher questionnaire expands data collection on teacher preparation, induction, organization of classes, and professional development. It also collects data on use of computers.

5.6 DATA COLLECTION

The Teacher Survey, like the other SASS components, is conducted by mailed questionnaire with telephone followup of nonrespondents. This section discusses the data collection procedures (5.6.1); measurement errors examined in cognitive studies in preparation for each round of the survey (5.6.2); a teacher transcript record check study (5.6.3); reinterview studies to measure response variance (5.6.4); and nonresponse (5.6.5).

5.6.1 Data collection

The Teacher Survey used slightly different data collection procedures at each round. For Rounds 1 and 2, questionnaires were mailed to the sample teachers at their schools during January and February (of 1988 for Round 1 and 1991 for Round 2). In February and March, a second questionnaire was sent to each sample teacher who had not yet responded. In March through June, U.S. Census Bureau field representatives initiated telephone followups of nonrespondents, calling either from their homes or from the U.S. Census Bureau's regional offices. The field representatives were instructed to call teachers at the schools to attempt interviews during nonteaching hours, for example, 8:00 a.m. to 9:00 a.m. and 3:00 p.m. to 5:00 p.m. For teachers unable to be interviewed at those times, they were to ask whether it would be possible to conduct the interview during a planning or free period.

Special procedures were used for schools whose sample teachers had been identified only by alphanumeric indicators (T1, T2, etc.). For these schools, the initial and followup questionnaires were mailed to the principal or other contact person at the school for distribution to the sample teachers. When telephone followups were necessary, the census field representative was instructed to call the principal or other contact person and ask that the teacher(s) who had not responded be requested to call the field representative in order to complete the interview.

Procedures for Round 1 only. In Round 1, a school coordinator was appointed for each school to assist with both the distribution of questionnaires and the followup of nonresponding teachers. About 10 days after the initial mailing of questionnaires to the sample teachers, a letter was sent to each coordinator, listing the sample teachers and asking the coordinator to remind them to complete and return their questionnaires. About 6 weeks after the first mailing, replacement questionnaires for the nonresponding teachers were sent to the coordinator in a package. The coordinator was also contacted by telephone and asked to distribute the questionnaires to the teachers and encourage them to complete and return their forms (NCES, 1992).

The use of school coordinators in Round 1 was based on the findings from a test that had demonstrated that response rates were higher for schools with coordinators, but that payment versus nonpayment of coordinators had no measurable effect on the results (Schwanz, 1987; Kaufman, 1988). The procedure was dropped in Round 2 in order to protect, to the greatest degree possible, the identity of the sample teachers in each school and, hence, the confidentiality of the data in the survey.

Because of the relatively large number of teachers who did not mail back their questionnaires in Round 1, telephone followups were conducted only for a sample of those who had not responded. Rounds 2 and 3 followed up all mail nonrespondents.

Round 3. In Round 3, the teacher questionnaires were mailed in three batches, after each of the three stages of sampling mentioned above. About 67 percent of the questionnaires were mailed in mid-December (wave 1), 26 percent in early January (wave 2), and 7 percent in mid-February (wave 3). One week after each mailing, a reminder postcard was sent to all sample teachers. About 3 weeks after the postcard, a second questionnaire was sent to teachers who had not responded. It was necessary to send second questionnaires to about two-thirds of the public school teachers, as compared with three-quarters of private school teachers, and one-half of the BIA school teachers.

Interviewers in the U.S. Census Bureau's telephone interviewing centers attempted computer-assisted telephone interviews (CATI) with private, BIA, and designated public school teachers who failed to respond by mail. Field representatives in the U.S. Census Bureau's regional offices attempted to telephone the remaining public school teachers and teachers for whom CATI interviewers were unable to collect the data (e.g., when the provided telephone number was incorrect). The field representatives' interviews used paper copies of the questionnaire as in previous rounds. The designation of public school teachers for CATI and non-CATI followup was done at the sampling stage as part of an experiment to evaluate data collection and mode effects (see following discussion on *Mode effect*).

Table 5-3 shows the numbers and percent of sample teachers in each sector requiring telephone interview followup in Round 3. By design, about one-third of the public school nonrespondents to the second questionnaire were followed up by local field representatives. In the other sectors, the corresponding proportion was about one in eight.

Table 5-3.—Teachers requiring and completing telephone interview followup, by followup interview and type of school: Round 3

	CATI followup				Non-CATI followup			
	Total		Completed		Total		Completed	
Sector	Number	Percent[1]	Number	Percent[2]	Number	Percent[3]	Number	Percent[4]
Public	13,241	24	7,001	53	6,690	12	4,169	62
Private	4,629	40	2,081	45	698	6	161	23
BIA	253	36	151	60	31	4	17	55

[1]Percent of sample cases in CATI followup.
[2]Percent of sample cases in CATI followup that were completed. Cases identified as noninterviews and out of scope for the survey during the CATI followup are not included.
[3]Percent of sample cases in telephone followup by field representatives.
[4]Percent of sample cases in telephone followup by field representatives that were completed. Cases identified as noninterviews and out of scope for the survey during followup are not included.
NOTE: Numbers do not total because of noninterview out-of-scope cases and because nonresponse cases may be switched between CATI and non-CATI followup.
SOURCE: Gruber et al. (1996).

Mode effect. Round 3 included an experimental study to evaluate the effects of CATI on the quality of data obtained from public school teachers (Cole, Abramson, Parmer, and Schwanz, 1997). This experiment, instituted at the sample selection stage, randomly designated about two-thirds of the public school sample teachers for centralized CATI followup (the CATI treatment

group), and the remaining one-third for telephone followup interviewing by field representatives in U.S. Census Bureau regional offices (the non-CATI treatment group). This assignment was done independent of the actual response mode. The final disposition showed that about 69 percent of the public school teacher interviews were returned by mail and, hence, needed no telephone followup, 19 percent were completed by CATI, and 12 percent by field representative telephone interviews.

The study compared weighted estimates for various items in the questionnaire between the two treatment groups, CATI and non-CATI, for three subsets of respondents: all respondents, mail-return respondents, and telephone followup respondents (CATI or field representative). The main comparisons of interest were among the telephone interview respondents, between those designated and interviewed by CATI, and those designated non-CATI and interviewed by telephone interviewers using the paper-and-pencil questionnaire. The controls (or placebo groups) were the mail-return respondents and the comparison between the designated CATI and non-CATI cases among them.

Significance tests were conducted to compare the responses obtained by the two designated treatment groups using a 10 percent significance level. The results (see table 5-4) showed significant differences for 18 percent of the items for all respondents, 14 percent for mail respondents only, and 29 percent for telephone respondents only as compared with the 10 percent expected by chance. The percent of significant differences for mail respondents is, not surprisingly, not much greater than expected by chance. The higher percent of significant differences for the other two sets of comparisons suggests mode effects. Many of the items for which these estimates from the two treatment groups were significantly different pertained to the teachers' perceptions and attitudes about their schools. Overall, the CATI respondents provided a more positive response than the respondents interviewed by the field representatives. For example, more of the CATI respondents reported that their principals let them know what was expected from them and their schools' administrations treated them fairly and were supportive.

Table 5-4.—Percent of items where weighted estimates from the CATI/Non-CATI treatment groups were significantly different: Round 3

	Percent of items		
Treatment group comparison	All respondents (100 percent)	Mail-return respondents (69 percent)	Telephone interview respondents (31 percent)
CATI/non-CATI weighted estimates with significant difference*	18	14	29

*Significant difference at 10 percent significance level.
SOURCE: Cole, Abramson, Parmer, and Schwanz (1997).

Supervision of field representatives and quality assurance. As in most of the other SASS surveys, one method of controlling the quality of the data collection operations was through regional office reviews of the questionnaires completed by interview with mail nonrespondents. In the regional office reviews, the first four Teacher Survey questionnaires completed by each

field representative were clerically checked. If the total number of errors (including omissions) for the four questionnaires was 10 or more, additional questionnaires were reviewed until there were 4 consecutive questionnaires with a total of fewer than 10 errors. For the other 3 basic SASS surveys, the standard used for this review was fewer than 10 total errors in 2 questionnaires (Gruber, Rohr and Fondelier, 1993, chapter VII).

U.S. Census Bureau field staff comments on the collection procedures. Following completion of field work for Round 2 of SASS and again after the completion of the 1992 pretest for Round 3, each census regional office was asked to submit its comments and suggestions on how the survey instruments and collection procedures could be improved. Among the most frequent suggestions relating to the Teacher Survey were the following (U.S. Census Bureau, 1991a, 1992):

- Distribute the questionnaires earlier in the school year, so that teachers and school administrators would not be asked to complete them during the period leading up to graduation, which is one of their busiest times of year;

- Develop a procedure for conducting telephone followup interviews with teachers by calling them at their homes. Completing telephone interviews during school hours proved difficult because of the length of the questionnaire, the sensitivity of some of the items, and limited access to telephones in many schools; and

- Make the cover page of the Teacher Survey questionnaire "friendlier" by including more information specifically addressed to the teacher, such as the letter from the Commissioner of NCES.

A procedure for conducting telephone followup interviews with teachers at their homes was tested in the pretest for Round 3, as described in section 5.6.2.

Length of time to complete questionnaire. The teacher questionnaires for Rounds 2 and 3 include a final question, "Not counting interruptions, how long did it take to complete this survey?" For questionnaires completed and returned by mail, the responding teacher completed this item; for questionnaires completed in followup telephone interviews, the interviewer completed the item. For Round 2, the median time for completion was 45 minutes for public school teachers and 40 minutes for private school teachers, with interquartile ranges of 30 minutes for both groups. About 99 percent of all teachers completed the questionnaire in less than 2 hours. For Round 3, the same questions were asked, however, data were unavailable for analyses.

5.6.2 Cognitive studies and pretesting

Before each round of the SASS survey, NCES conducts field tests, cognitive studies, and reinterviews as part of the continuing effort to improve survey quality. Section 2.6.2 summarizes the activities conducted for the School Survey and other SASS components. This section describes these activities for the Teacher Survey.

Round 1 pretest reinterviews. As described in section 2.6.2, the first reinterviews for the Teacher Survey occurred in conjunction with a large-scale pretest for Round 1 of SASS in the early part of 1987. The pretest, which covered 10 states, included 2,300 teachers in 220 public schools and

600 teachers in 75 private schools. The questionnaires were distributed by mail. A systematic sample of 127 teachers who responded to the mail questionnaire was selected for telephone reinterview by U.S. Census Bureau field representatives. Reinterviews were successfully conducted for 121 of them, for a 95 percent completion rate. In the reinterviews the teachers were asked how they had interpreted and answered selected questionnaire items, the extent to which they used or could have used records in responding, how much confidence they had in the accuracy of their responses, and whether they had any recommendations for improving the questionnaire.

The report of the reinterviews (Nash, n.d.) included several recommendations for improvements in specific questionnaire items:

- In answering questions about college-level courses taken, about one-half of the teachers reinterviewed said they had referred to records and a large proportion of the rest said they had records available. As a result of this finding, an instruction was added to the relevant items on the final questionnaire for Round 1, "Please refer to records if you cannot accurately recall your coursework." (For further information on the accuracy of responses to questions about degrees and courses taken, see the Teacher Transcript Study, section 5.6.3).

- The pretest question on mathematics and science courses asked for number of credit hours completed. Most teachers felt it would be easier to report number of courses, and this recommendation was followed on the final questionnaire for Round 1.

- For a question on how the teacher's classes were organized, comments in the reinterviews led to the addition of a new category, pull-out classes (where teachers provide instruction to students who are released from their regular classes), to the final version of this item for Round 1.

- For an item on time spent in school-related activities, the reinterviews showed that about two in five teachers, in responding, had not included time spent away from school on such activities. As a result, separate sub-items covering time for certain kinds of activities away from school were added to the final version.

1990 pre-Round 2 cognitive interviews. U.S. Census Bureau staff members, using an early version of the 1990 pretest questionnaire, conducted "think-aloud" interviews with 20 teachers, 10 from public schools and 10 from private schools, representing various grade levels and specialties (Bates and DeMaio, 1990). The teachers were asked to verbalize their thoughts as they completed the self-administered questionnaires. The census staff members asked questions as needed to understand how the teachers were interpreting the questions and what they were including in their answers. Findings from these interviews and from the subsequent pretest significantly influenced the development of the final questionnaires for the Round 2 Teacher Survey.

The U.S. Census Bureau staff members observed that teachers often failed to follow skip instructions (telling them to pass over questions that did not apply to them) and that they frequently failed to check boxes for "none," either leaving the item blank or entering "0" in the space reserved for an amount or number. For the most part, these errors were unlikely to bias the

survey estimates, because the correct responses could be inferred, during data processing, from other entries on the questionnaire. However, the attempts by the teachers to answer questions that did not apply to them caused frustration that could lead to a decline in the perseverance needed to provide complete and accurate answers.

One possible solution to the problem of the failure to skip inapplicable questions is to include redundant instructions, for example, using both a skip instruction next to the answer spaces in the item where the skip begins (the branching item) and an instruction at the beginning of each item that applies only to respondents with certain characteristics. The pretest questionnaire had some redundancy of this kind; the U.S. Census Bureau staff interviewers recommended additional use of redundant instructions.

Numerous problems were observed with an item for teachers who were teaching subject-matter (departmentalized) courses to different groups of students. This item asked responding teachers to enter, in a matrix format, several items of information for each separate class they had taught in the most recent full week of teaching. The instructions for the items to be reported for each class appeared on the page preceding the matrix for recording the items.

The word "class" itself caused difficulty because some teachers interpreted it to mean class period rather than, as was intended, a group of students receiving instruction in a subject during one or more class periods in the reference week. One of the specific items requested for each class was the number of graduation units associated with it. The instructions for this item asked the teacher to enter a code (0 for no credit, 1 for less than one unit, 2 for one unit, etc.), but some teachers entered the actual number of units rather than the code, an error not likely to have been detected in data processing.

Difficulties were also observed for an item about hours spent on school-related activities during and after school hours. As noted above, a similar item in Round 1 had numerous response problems and the responses were not included in the public-use data tapes. The main kinds of problems noted were the following:

- Answers were given in terms of hours per day, rather than for a reference week; and
- Errors due to misunderstanding of the question format, which called for reporting time spent during and after school hours separately and, in each case, providing a total and a breakdown into two or more categories.

This content of this item was substantially reduced and modified in the final questionnaire for Round 2.

The U.S. Census Bureau staff reporting on these interviews made several recommendations for changes in specific items and for additional research on some of the kinds of response problems that were observed. Many of their recommendations were adopted for implementation in Round 2.

Item-by-item review in 1990 (pre-Round 2). Over 900 Teacher Survey questionnaires from the 1990 SASS field test (pre-Round 2) were reviewed to identify items that were misunderstood by

respondents or were difficult for them to answer (Fondelier and Bynum, 1990). The reviewers found several indications that respondents were concerned about the length of the questionnaire: notes to this effect on the forms, partially completed questionnaires and information on reasons for refusals. They also observed that the quality of data for mail responses appeared to be much better than that of the responses obtained by telephone followup. This was attributed in part to the unsuitability of the questionnaire design and format for telephone interviews, especially when the interviews had to be completed with teachers at their places of work, and in part to failure of the telephone interviewers to follow skip instructions and to complete items correctly and legibly.

The specific item found by the reviewers to have the most problems asked for information about classes taught in departmentalized courses (see also the comments on this item in the preceding discussion of cognitive interviews). Several respondents misinterpreted the meaning of "class" and several clearly failed to read the instructions that appeared on the page preceding the one on which the answers were to be recorded. For some elementary music, art, and physical education teachers, insufficient lines were provided to record the data requested for each of their classes.

The reviewers made numerous specific proposals for changes in the wording and format of questions and instructions. Many of their recommendations, as well as some of those emanating from the cognitive interviews, were followed in the final questionnaires for Round 2.

1991-92 Round 3 pretest. The 1991-92 field test teacher sample consisted of 420 public school teachers and 480 private school teachers; the response rate of teachers from both school sectors was over 96 percent. The teacher field test was used to evaluate changes to the teacher questionnaire: items to delete, to revise, and to add to the Round 3 teacher questionnaires. Since prior experience had shown that U.S. Census Bureau interviewers had difficulty in conducting telephone interviews with mail nonrespondents at school, a Round 3 pretest included a test of an alternative approach. In that pretest, which was conducted early in 1992, a postcard was sent to each sample teacher who had not responded within about 2 weeks of the second mailing. The message included the following:

> If we do not receive your completed questionnaire by mail within 2 weeks, we will contact you by telephone at your school to collect this information. If you prefer to be contacted at home, please provide your home telephone number on the attached postcard and return it in the next few days.

Teachers who supplied their home telephone numbers were contacted for interviews at their homes (Ferrell, 1992). Only a small proportion of teachers returned the postcards (only 17 of the 350 teachers to whom they were sent). This procedure was therefore not adopted for followup of mail nonrespondents in Round 3.

Pre-Round 4 cognitive studies. A large pretest was conducted in the fall of 1998 for Round 4, the results of which will appear in the *Data File User's Manual* for Round 4. As part of the redesign of the questionnaires for Round 4, cognitive interviews were conducted with 20 teachers (Jenkins, 1997). The goals of this study were to determine the effectiveness of new formats and how well respondents comprehended the questions. The interviews were conducted

at the U.S. Census Bureau's cognitive laboratory with 15 teachers from different school types and with various teaching experience, and in New Jersey with 5 teachers who were identified by the State Department of Education as having alternative certificates. The latter 5 cognitive interviews were conducted because the answers of such teachers to a question about the type of certificate were considered to be problematic.

Various cognitive techniques were used, including the concurrent think-aloud technique, the use of paraphrasing, and unstructured retrospective interviewing that excluded sections that did not contain problematic items. Respondents were asked to complete a shortened teacher questionnaire. They were asked to read aloud as they read through the questionnaire and to think aloud as they answered the questions. The interviews took between 30 and 90 minutes to complete. They were tape-recorded with the respondent's permission, and a transcript or a summary was prepared for each interview.

An item-by-item review of the interview results identified some formatting issues and problems with skip instructions. The proposed changes to the questionnaire included the use of color backgrounds (blue for the private school questionnaire and green for the public school questionnaire) and white spaces to offset answer space, the use of a one-column vertical format, and skip instructions to help navigate the respondents through the questionnaire.

5.6.3 A teacher transcript record check study

In Round 2 of SASS, an experiment was undertaken to compare the accuracy of teachers' self-reports about their educational backgrounds with data obtained from transcripts of their college records (Chaney, 1993, 1994). The data items compared for the two methods included degrees awarded, year of award, major and minor fields of study, and number of courses taken or credit hours earned in four separate areas: education, area of main teaching assignment, area of second teaching assignment, and science and mathematics.

The study was carried out "off-line," that is, a separate sample of teachers was used for the experiment. Two versions of the Teacher Survey questionnaire were administered, one asking for information on the number of courses taken and one asking for information on the number of credit hours earned in the relevant fields. Out of the initial sample of 867 teachers, 32 were later found to be ineligible for the study. Of the 835 eligible teachers, 592 (71 percent) agreed to participate in the study and provided names of the colleges they had attended, so that transcripts could be requested from these colleges.

The teacher questionnaires were administered by the U.S. Census Bureau, using the standard mailing and telephone followup procedures. The request for permission to obtain respondents' transcripts came at the end of questionnaire. Thus for telephone interviews, the knowledge that this was to be done was unlikely to have influenced responses about degrees and courses. It is possible that some of the mail respondents could have gone back and checked their responses to these items after they discovered that their transcripts would be obtained.

A total of 1,835 transcripts was requested. A transcript was provided for 74 percent of these cases and for 3 percent the college said it had no record of the identified person having attended. (For about one-third of the latter group, the teacher's attendance at the college could be

confirmed on the basis of transfer notations on another college's transcript.) In 4 percent of the cases the college said it could not locate the records and for the remaining 19 percent the college did not respond to the request. The colleges also provided 168 transcripts that were not requested. These were generally instances where the same person had both undergraduate and graduate work at the institution but did not report both on his or her questionnaire.

For the 592 sample teachers who participated in the study, all requested transcripts were obtained for 51 percent, some but not all transcripts were obtained for 41 percent, and no transcript information was obtained for the remaining 8 percent. For some of the data items, such as degrees awarded, partial transcript information was sufficient to confirm self-reported data. However, if a teacher's self-reported degree was not confirmed, it would be difficult to conclude that the self-report was incorrect unless all requested transcripts for that teacher had been received.

The data from the comparisons indicated that self-reports of types and years of degrees earned and major fields were, for the most part, accurate. However, information on numbers of courses and credit hours was less accurate. The study report says the following:

> Other errors appeared to show bias on the part of the respondent. For example, though there were errors in both directions, the general pattern was for teachers to overstate their preparation in their second teaching assignment and in mathematics and science as compared with the records on their transcripts. Since courses were coded as falling within the specified areas if there were any ambiguity, this overstatement is the reverse of what might be expected if there were simply differences between the teachers and coders in how to classify courses (Chaney, 1994, p.20).

Any proposal to rely on transcripts as the primary source of information on courses for sample teachers would, of course, have to take into account the additional costs associated with the collection of transcript data and the likelihood of higher item nonresponse resulting from failure of teachers to report all of the colleges where they had taken courses and failure of some colleges to supply the requested transcripts.

5.6.4 Reinterviews

After each round of SASS, reinterviews have been attempted for about 1,100 teachers, or about 1 in 60 of the total sample. They were successfully completed for about 75 percent of the eligible cases in Round 1, 83 percent in Round 2, and 73 percent in Round 3. All reinterviews of teachers in Rounds 1 and 2 were conducted by telephone. Round 3 used the same mode at reinterview as the original survey; about two-thirds of the cases were completed by mail and the remaining one-third were completed by telephone followup (either centralized CATI or field representative interviews).

Topics covered in the reinterviews. There were many differences between rounds in the topics covered in the Teacher Survey reinterviews. The four topics covered in both Rounds 1 and 2 were educational attainment, full- and part-time teaching experience by sector (public and private), current teaching assignment, and plans to continue teaching. However, there were some significant changes in question wording or format of items and few items used in Round 1 were

replicated in Round 2. The Round 3 reinterview covered six areas: teaching assignment and certifications, Chapter 1 status, teacher activities, in-service or professional development programs, student behavior problems, and teacher salary and benefits.

Table 5-5 presents reinterview findings for both Rounds 1 and 2 for the questions on teachers' educational attainment. The format for the questions on educational attainment was substantially revised between the two rounds. In Round 1, a single "mark all that apply" question was asked for the following: associate degree or vocational certificate, bachelor's degree, second bachelor's degree, master's degree, second master's degree, education specialist or professional diploma (at least one year beyond Master's level), doctorate (e.g., Ph.D., Ed.D.), first professional degree (e.g., M.D., L.L.B., J.D., D.D.S.), and no degree or diploma. Round 2 had two single "Yes/No" questions: Do you have a bachelor's degree?; do you have a master's degree?, and a "mark all that apply" question for degrees such as associate degree, education specialist/a professional diploma, and doctoral or first professional degree.

Table 5-5.—Measures of inconsistency for educational qualifications in the Teachers Survey: Rounds 1 and 2

	Percent mention (survey interview)		Gross difference rate		Index of inconsistency	
Educational attainment items	Round 1 (1987-88)	Round 2 (1990-91)	Round 1 (1987-88)	Round 2 (1990-91)	Round 1 (1987-88)	Round 2 (1990-91)
Bachelor's degree	98	98	8*	1*	80	—
Master's degree	42	41	4*	1*	9*	2*
Prof. dipl./Ed. spec.	4	5	7	5	70	63
Associate degree	14	7	8	7	37*	54*

—Not available. (Not computed because there were too few cases without a bachelor's degree.)
*Statistically significant difference between Round 1 and Round 2 (at a 10 percent significance level).
SOURCE: Bushery, Royce, and Kasprzyk (1992).

The findings in table 5-5 are expressed in terms of the gross difference rate (the percent of discrepant answers for the item between the original response and the reinterview response) and the index of inconsistency (see section 2.6.4). As was the case for the School Principal Survey (see section 3.3 and table 3-8), the data suggest that the revisions led to more reliable and accurate reporting on bachelor's and master's degrees in Round 2, even though deficiencies in Round 1 for teachers had been less serious than for school principals. The same could not be said for the reporting of associate degrees and educational specialist or professional diplomas; in fact, the index of inconsistency for associate degrees was somewhat higher in Round 2.

Table 5-6 shows Round 1 and Round 2 reinterview results for questions on years of teaching experience, full- and part-time, in the public and private sectors. For this analysis, responses were classified into four categories: less than 3 years, 3-9 years, 10-20 years, more than 20 years. In both rounds, the two full-time questions had relatively low response variance, but this was not true for the questions on part-time teaching. Despite the use of a redesigned format for the part-time questions in Round 2 (using 4 response categories instead of asking the respondents to fill in the number of years), no significant improvements were noted and the gross difference rate for part-time teaching in private schools actually increased somewhat.

Table 5-6.—Measures of inconsistency on the topic "years of teaching" in the Teacher Survey: Rounds 1 and 2

Years of teaching experience[1]	Gross difference rate		Index of inconsistency	
	Round 1 (1987-88)	Round 2 (1990-91)	Round 1 (1987-88)	Round 2 (1990-91)
Full-time, Public	8	7	11	10
Part-time, Public	9	7	44	43
Full-time, Private	5	5	12	9
Part-time, Private	[2]3	[2]8	39	38

[1]For this analysis, responses were classified into four categories: less than 3 years, 3-9 years, 10-20 years, more than 20 years.
[2]Statistically significant difference between Round 1 and Round 2 (at a 10 percent significance level).
SOURCE: Bushery, Royce, and Kasprzyk (1992).

It is difficult to compare the reinterview results for Rounds 1 and 2 for the questions on teaching assignment since they were substantially changed. For plans to remain in teaching, the same question was used in both rounds and the estimates of the gross difference rate and the index of inconsistency were both significantly higher for Round 2. The gross difference rate rose from 40 percent to 47 percent and the index of inconsistency rose from 55 to 67.

Table 5-7 shows the distribution of estimated indexes of inconsistency for all items used in the Teacher Survey reinterviews in each round. In Round 1, about two-thirds of the items included were opinion questions and, as shown in the table, nearly all of them had indexes in the high range (values of 50 and over). These items covered teachers' views about topics like problems in their schools, their influence on school and classroom policies and practices, and the extent to which school administrators and other teachers had been helpful to them. In Round 2, only three opinion items were covered in the Teacher Survey reinterviews because it was felt that reinterview results for factual questions would be of more value for identifying problem questions and guiding efforts to improve their wording and format.

One of the factual items included in the reinterviews in Round 2 asked teachers to report the grade levels for their current classes. There were 16 possible response categories, with an instruction to mark each one that applied. For the purpose of estimating indexes of inconsistency, each of the 16 categories was treated as a separate item. All of the 13 categories for which estimates could be made had indexes in the low range, which was not surprising for such a relatively straightforward item. The data in table 5-7 for factual items in Round 2 are shown with and without this item (item 29). When it is excluded, the distributions for factual items in Rounds 1 and 2 are somewhat similar.

Aside from the opinion items and the topics covered in reinterviews for both rounds, which we have already discussed, the topics with high indexes of inconsistency, as measured by reinterviews, were pay incentives in Round 1 and nonteaching income, courses and certification in Round 2.

Table 5-7.—Number of items by index of inconsistency in the Teacher Survey: Rounds 1-3

Index of inconsistency[1]	Round 1 (1987-88)		Round 2[3] (1990-91)			Round 3 (1993-94)	
	Factual	Opinion	Factual, all	Factual, excl. item 29	Opinion	Factual	Opinion
Total questions	20	42	53	37	3	78	14
Low (0-19%)	3	0	21	8	0	11	0
Moderate (20-50%)	4	3	14	14	2	30	6
High (51-100%)	5	39	10	10	1	22	8
Not available[2]	8	0	8	5	0	15	0

[1]Each item either had closed multiple-response categories or was converted to the equivalent by assigning class intervals to open-end responses. For items with more than 2 response categories, the L-fold index of inconsistency was estimated.
[2]Did not meet the minimum requirements to compute a reliable estimate of the index of inconsistency.
[3]Questionnaire item 29 asked about grade levels for the responding teacher's current classes, with 16 possible response categories. Since the teacher was asked to mark each category that applied, item 29 had to be treated as 16 separate items for the purpose of estimating indexes of inconsistency.
SOURCES: Newbrough (1989); Royce (1994); Bushery, Schreiner, and Sebron (1998).

The Round 3 reinterview study included a different set of questions than Rounds 1 and 2 (see Bushery, Schreiner, and Sebron, 1998). Among the questions evaluated, 30 questions had high indexes of inconsistency (indexes greater than 50). Items with high levels of inconsistency included two items on teacher certification, half of the items evaluated on teacher activities, several of the items on in-service or professional development programs, and several items on student behavior. The reinterview results suggested that some perception and opinion questions with high levels of inconsistency might be appreciably improved by using fewer response categories. For example, relative to items using four response categories (serious, moderate, minor, or not a problem), items that used only two categories (problem and not a problem) showed much less inconsistency.

5.6.5 Nonresponse

Unit nonresponse. Unit nonresponse could occur in the Teacher Survey for two reasons: a sample school could fail to provide a list of teachers for use in selecting the teacher sample (or, alternatively, fail to select a sample of teachers itself) or an acceptable questionnaire might not be obtained for a sample teacher. We will refer to these two sources of nonresponse as school list nonresponse and teacher nonresponse and their complements as school list response and teacher response.

The school list response rate is the percent of sampled schools eligible for the School Survey that provided the teacher lists or selected the teacher sample. The teacher response rate is the percent of sample teachers eligible for the Teacher Survey who responded to the survey. The product of the school list and teacher response rates is termed the overall teacher response rate; it provides an indicator of the overall response rate for the Teacher Survey.

The teacher response rate is confined to sample schools in which teachers were sampled, and excludes school staff who were sampled but who did not meet the survey definition of a teacher or who were no longer working at the sample school at the time the teacher questionnaire was distributed. In Round 2, 7 percent of those sampled from teacher lists in public schools and 12 percent of those sampled in private schools were found to be out of scope. In Round 3, the corresponding percents were 7 percent in public schools and 10 percent in private schools.

Table 5-8 shows the school list, teacher, and overall teacher response rates for public and private schools in Rounds 1 to 3. The school list response rates are unweighted whereas the teacher response rates are weighted by the teacher basic weight to reflect the probability of selection. Public schools have both higher school list and higher teacher response rates than private schools in all three rounds. As a result, the overall response rates for public schools were, on average, some 12 percentage points higher than those for private schools.

Table 5-8.—School list, teacher, and overall response rates for the Teacher Survey, by sector: Rounds 1-3

	Response rate (percent)		
Sector and component	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Public			
School list[1]	96	95	96
Teacher[2]	86	90	88
Overall[3]	83	86	84
Private			
School list[1]	88	90	91
Teacher[2]	79	84	80
Overall[3]	70	75	73

[1]Percent of schools eligible for the SASS School Survey that provided teacher lists for use in sampling teachers, unweighted.
[2]Percent of eligible sample teachers responding to the Teacher Survey, weighted by the basic teacher weight to reflect the probability of selection.
[3]Product of school list and teacher response rates.
SOURCES: NCES (1991d); Gruber, Rohr, and Fondelier (1993, 1996).

The teacher response rates in table 5-8 are higher in Round 2 than Rounds 1 and 3, which was unexpected. Based on the results of the Round 1 pretest experiment with coordinators, one might have predicted lower teacher response rates in Round 2, when no coordinators were used, but the reverse occurred. Round 3 used a three-wave approach intended to allow more time for data collection from teachers. However, this approach did not improve the teacher response rate.

Public school teachers. Table 5-9 shows the weighted teacher response rates for public school teachers by state for Rounds 1 to 3. With exception of the District of Columbia, whose response rate stood at around 70 percent for all three rounds, no state had a response rate of less than 80 percent in Rounds 2 and 3, and only four states (Hawaii, Maryland, New York, and Rhode Island) had response rates below 80 percent in Round 1. In all three rounds a majority of states recorded response rates of 90 percent or higher.

Table 5-9.—Weighted response rates for public school teachers in the Teacher Survey, by state: Rounds 1-3

State	Weighted response rate (percent)*		
	Round 1 (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total	86	90	88
Alabama	90	91	90
Alaska	90	90	86
Arizona	91	95	90
Arkansas	91	94	91
California	84	88	82
Colorado	89	95	88
Connecticut	80	86	88
Delaware	86	96	86
District of Columbia	69	69	71
Florida	87	89	91
Georgia	87	93	92
Hawaii	74	88	86
Idaho	93	95	93
Illinois	91	96	87
Indiana	92	95	91
Iowa	93	96	92
Kansas	91	96	91
Kentucky	86	89	90
Louisiana	81	93	91
Maine	92	90	90
Maryland	74	90	88
Massachusetts	85	84	87
Michigan	86	85	89
Minnesota	90	94	93
Mississippi	88	93	91
Missouri	88	91	92
Montana	91	95	92
Nebraska	93	93	92
Nevada	91	89	84
New Hampshire	85	93	90
New Jersey	81	86	86
New Mexico	85	90	90
New York	75	79	80
North Carolina	89	96	90
North Dakota	93	96	93
Ohio	88	88	89
Oklahoma	90	94	87
Oregon	94	91	90
Pennsylvania	88	93	88
Rhode Island	75	87	85
South Carolina	89	91	91
South Dakota	95	95	89
Tennessee	85	93	89
Texas	87	92	90
Utah	90	98	92
Vermont	87	96	86
Virginia	87	91	90
Washington	90	88	88
West Virginia	88	95	92
Wisconsin	89	95	93
Wyoming	91	97	91

*Basic weight is used to reflect the probability of selection. Rates restricted to schools providing teacher lists.

SOURCES: NCES (1991d), Gruber, Rohr, and Fondelier (1993, 1996).

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Private school teachers. Table 5-10 shows teacher response rates for private school teachers by association group and school types for Rounds 1 through 3. In Round 1, the lowest rate observed, 58 percent, was for teachers in schools included in the area sample. For the list samples, response rates ranged from 61 percent to 87 percent. In Round 2, the teacher response rate for the area frame schools was 74 percent, and the response rates for the list samples ranged from 57 to 95 percent. In Round 3, the response rate for area frame teachers was 71 percent, and the rates for the list samples ranged from 56 to 91 percent.

Analytic studies were conducted for Rounds 2 and 3 to examine variations in response rates for different categories of school. Some results are displayed in table 5-11. The study by Scheuren et al. (1996), which investigated variations in response rates for the first four characteristics in the table for Round 2, used a Bonferroni multiple comparison test with a 10 percent significance level for each characteristic. In the table S denotes a significant difference in response rates between at least one pair of categories for the characteristic; NS denotes no significant differences. Some significant category differences were found by region and school size for both public and private schools, by urbanicity for public schools, and by school level for private schools.

Monaco, Salvucci, Zhang, Hu, and Gruber (1998) performed similar analyses for the 1993-94 Round, including the four characteristics examined in the 1990-91 study and adding the characteristics displayed in the lower part of table 5-11 (some of which related only to public schools, others only to private schools). They used an overall test of differences across categories; the significance level reached is indicated by the *P*-value in the table. The results for Round 3 exhibits similar pattern of significance/nonsignificance for the first four characteristics as Round 2. For private schools, a significant difference was found by urbanicity in Round 3 that was not observed in Round 2.

The new characteristics added for the 1993-94 analyses for public school teachers show a variation in response rate by school type (regular or nonregular), minority enrollment, new teacher (yes or no), and race/ethnicity. For private school teachers, statistically significant variations are found by race/ethnicity, whether the school was sampled in Round 2 of SASS in 1990-91, and by the response status of the schools in the 1991-92 PSS.

Item nonresponse. Table 5-12 summarizes unweighted item response rates for public and private school teachers in Rounds 1 to 3. Because of changes in questionnaire content and wording, the rates for the rounds are not directly comparable. The percent of items with response rates of 90 percent or more were around 90 percent for Rounds 1 and 3, but were appreciably lower for Round 2. The minimum item response rate was appreciably lower in Round 1 than in subsequent rounds. The items involved were deleted or revised for the later rounds.

The percent of items with response rates below 75 percent were typically very small. In Round 1, two questionnaire items for both public and private schools had response rates below 75 percent. The first of these was an item asking for the second major or the minor field of study for each degree reported. Teachers responding to the questionnaire were asked to enter a code 00 if they did not have a second major or a minor field. Apparently, many of them simply left

Table 5-10.—Weighted response rates for private school teachers in the Teacher Survey, by association group and school type: Rounds 1-3

Association group	Weighted response rate (percent)[1]		
	Round 1[2] (1987-88)	Round 2 (1990-91)	Round 3 (1993-94)
Total (area and list frames)	79	84	80
List frame	—	84	80
Area frame	58	74	71
Schools on list frame by association group:			
Association of Military College and Schools of United States	85	88	89
National Catholic Education Association, Jesuit Secondary Education Association	84	88	83
Friends Council on Education	85	87	84
National Association of Episcopal Schools	82	84	84
National Society of Hebrew Day Schools	64	60	63
Solomon Schechter Day Schools		84	78
Other Jewish		57	56
Lutheran Church—Missouri Synod	87	95	91
Evangelical Lutheran Church—Wisconsin		92	91
Evangelical Lutheran Church in America		87	88
Other Lutheran		89	84
General Conference of Seventh-Day Adventists	81	82	89
Christian Schools International	87	90	77
American Association of Christian Schools	61	70	64
National Association of Private Schools for Exceptional Children	71	76	81
American Montessori Society Schools, other Montessori Schools	79	77	72
National Association of Independent Schools	83	85	83
National Independent Private Schools Association	‡	‡	75
Other private schools	74	84	76
Schools on list frame by school type:			
Catholic	—	88	83
Parochial	—	87	83
Diocesan	—	89	83
Private order	—	90	84
Other religions	—	79	75
Conservative Christian	—	77	70
Affiliated	—	83	75
Unaffiliated	—	77	81
Nonsectarian	—	83	82
Regular	—	84	83
Special emphasis	—	79	78
Special education	—	86	81

—Not available. (Data were not collected or not reported.)
‡Not applicable. (Not listed as a separate association group.)
[1]Basic weight is used to reflect the probability of selection. Rates restricted to schools providing teacher lists.
[2]Round 1 used one Lutheran Church group and one Jewish school group.
SOURCES: NCES (1991d); Scheuren et al. (1996); Monaco et al. (1998).

Table 5-11.—Weighted response rates for the Teacher Survey, by selected characteristics and school sector: Rounds 1-3

Characteristics	Weighted response rate (percent)[1]			
	Round 2 (1990-91)		Round 3 (1993-94)	
	Public	Private	Public	Private
Region				
West	90	82	86	89
South	92	84	90	82
Northeast	85	84	85	82
Midwest	92	87	90	78
	S[2]	S[2]	P<0.001	P<0.001
Urbanicity				
Central city	87	84	91	79
Urban fringe/large town	89	84	87	80
Rural	93	85	91	83
	S[2]	NS[3]	P<0.001	P=0.009
School level				
Combined	91	82	88	77
Secondary	90	87	87	84
Elementary	91	85	88	81
	NS[3]	S[2]	P=0.523	P<0.001
School size				
1-149	92	78	91	75
150-499	92	86	89	82
500-749	90	84	88	82
750+	89	87	87	81
	S[2]	S[2]	P<0.001	P<0.001
School type				
Non-regular	‡	‡	86	‡
Regular	‡	‡	88	‡
			P=0.017	
Minority enrollment				
<5.5%	‡	‡	91	‡
5.5-20.5%	‡	‡	89	‡
20.5-50.5%	‡	‡	88	‡
>50.5%	‡	‡	83	‡
			P<0.001	
School sampled with certainty				
Yes	‡	‡	88	‡
No	‡	‡	88	‡
			P=0.801	
School sampled in Round 2 SASS				
Yes	‡	‡	88	88
No	‡	‡	88	82
			P=0.427	P<0.001
New teacher				
Yes	‡	‡	90	81
No	‡	‡	88	80
			P=0.003	P=0.321
Race of teacher				
AIAE	‡	‡	87	78
API	‡	‡	88	82
Black/Non-Hispanic	‡	‡	84	70
Hispanic	‡	‡	86	79
White	‡	‡	90	68
Other	‡	‡	81	81
			P<0.000	P<0.001
1991-92 PSS status				
Respondent	‡	‡	‡	81
Nonrespondent	‡	‡	‡	64
Not in 1991-92 PSS	‡	‡	‡	68
				P=0.002

[1]Not applicable.
[1]The basic weight is used to reflect the probability of selection.
[2]S indicates a significant association between response rates for any levels of the variable at the 10 percent significance level.
[3]NS indicates there is not a significant association between response rates of the variable at the 10 percent significance level.
SOURCES: Scheuren et al. (1996); Monaco et al. (1998).

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Table 5-12.—Percent of items with selected response rates for the Teacher Survey: Rounds 1-3

Sector	Percent of items with response rates: ≥ 90 percent	< 75 percent	Minimum of item response rate (percent)
Round 1 (1987-88)			
Public	90	1	64
Private	89	1	60
Round 2 (1990-91)			
Public	84	0	76
Private	79	1	71
Round 3 (1993-94)			
Public	91	0	71
Private	89	1	69
BIA	84	3	70

SOURCES: NCES (1991d); Gruber, Rohr, and Fondelier (1993, 1996).

the item blank. The second item with low response was the space for entering the total of a set of responses to items asking teachers to report their hours spent in school, during the most recent full week, on five categories of school-related activities. Because of data reporting problems, the data for this entire set of items, which also covered time spent on school-related activities after school hours, were excluded from the public-use data tapes for the Teacher Survey.

Most of the low item response rates observed on the Round 2 Teacher Survey questionnaires were for items that asked teachers who had answered "Yes" to a question to report a related number or amount. For example, in an item on teacher training, several teachers who reported that they had taken courses in one or more of the subjects listed failed to enter the number of such undergraduate and graduate courses that they had taken (or to check the box for "none" in one of these categories). Similarly, teachers who reported that they had received certain types of income frequently failed to report the amounts.

In Round 3, 7 items in the BIA school teacher questionnaire had response rates below 75 percent. They included items on time spent working as a teacher at the school; other main activity; the number of separate classes (or sections) taught; and salary amount and family income.

5.7 DATA PROCESSING

The sequence and nature of the data processing operations for Rounds 1 to 3 of the Teacher Survey are similar to those described for the other three basic SASS surveys in chapters 2 to 4. Following the same sequence used in the preceding chapters, this section discusses: edit procedures (5.7.1), imputation (5.7.2), weighting (5.7.3), and variance estimation (5.7.4).

5.7.1 Edit procedures

Clerical edits. As part of the clerical edit, codes were assigned to occupation and industry entries for teachers whose prior job had been outside the field of education. One difference for the Teacher Survey was that data entry keying was verified for a sample of one-third of the questionnaires in Round 2, whereas 100 percent verification was used in Round 3 and for the other surveys.

In some instances, the clerks who reviewed the questionnaires rejected in the computer pre-edit operation were required to contact the teachers in an attempt to resolve discrepancies and omissions for critical items. The most frequent reasons for pre-edit rejection of questionnaires were inconsistencies in responses relating to full-time and part-time employment status and failure to respond to a question on main teaching assignment.

Interview status edit. Following the main computer edit and prior to imputation, an interview status edit was performed. Questionnaires were classified as out of scope if, for any reason, they were not members of the target population for the Teacher Survey (see section 5.2). Questionnaires for in-scope teachers were classified as interviews and included in the tabulations only if all the following conditions were met:

- The teacher reported the year that he or she started working as an elementary or secondary teacher;
- At least one part of the educational background section had an acceptable response;
- The teacher reported his or her main assignment field and whether or not he or she was certified in that field;
- The teacher reported at least one grade level of students currently being taught by him or her; and
- There were responses for at least 30 percent of the set of required items that a teacher should complete.

Teachers whose questionnaires did not meet these minimum requirements were treated as nonrespondents in computing the unit response rates presented in section 5.6.5. The editing procedure changed the preliminary interview status code for 4 percent of interviewed teachers in public schools and about 6 percent of interviewed teachers in private and in BIA schools. The changes involved reassigning interview cases as noninterview cases, and in some instances, as out-of-scope cases.

Errors uncovered in editing. Reviews of unedited and edited questionnaires and reviews of output from processing operations (clerical edit, computer pre-edit, computer edit, and imputation) provide indications of measurement error, some systematic and some anecdotal. Such findings generally support and extend what has been learned in more formal evaluations through reinterviews, cognitive interviews, and record checks (such as the Teacher Transcript study) discussed in section 5.6.

For Round 2, information on both measurement error and item nonresponse is available from a review of post-edit item response rates, pre-edit reject rates and edit change tallies (Jenkins, 1992a). This review, which covered all four of the basic SASS surveys, showed that, in comparison with the other surveys, pre-edit reject rates for the Teacher Survey were relatively low but that item nonresponse rates were somewhat higher than for the other surveys. Nonresponse was relatively high for several parts of the item on classes in departmentalized courses. This item had already been identified, in cognitive interviews and questionnaire reviews prior to data processing, as having significant response problems. The edit change tallies showed that, as had been observed at earlier stages, respondents frequently answered items that did not apply to them. For Round 3, the *Data File User's Manual* (Gruber et al., 1996) lists the data items and the counts of edit changes for each item in the teacher questionnaires (public, private, and BIA) used in that round.

5.7.2 Imputation

Imputation procedures for the Teacher Survey followed the same general pattern as imputation for the School Survey (section 2.7.3). Some responses were assigned for missing or inconsistent values during the computer edit and, in a few cases where the correct entry was obvious, items were changed without contacting respondents in the initial clerical edit and in the resolution of rejected cases from the computer pre-edit. However, in Rounds 2 and 3 most of the imputation was done in a computer operation following the computer edit.

In Round 1 no computer imputation was done initially for missing or blanked values and the values were left blanks. Item imputation for Round 1 was complete when the data were released on a CD-ROM with data from Rounds 1 through 3 (NCES, 1998). In Round 2, computer imputation proceeded in two stages. In the first stage, missing or previously blanked values for selected items were imputed by using other information for the same teacher or making assumptions about the respondent's intended answer, for example, that not answering a question implied a response of "No." In the second stage, a hot deck procedure was used to impute the remaining missing values. The matching variables used to form imputation groups for each item and the order of their collapsing (when necessary to form sufficiently large imputation groups) are described in Part VIII of the *Data File User's Manual* (Gruber et al., 1993, for Round 2; and Gruber et al., 1996, for Round 3). In Round 3, a third stage of clerical imputation was added to handle items for which there were very few missing responses and a few cases where no hot deck donor was available.

In Round 1 no flags were assigned to identify items imputed during the computer edit or earlier stages of processing. In Round 2, flags were assigned to all items imputed in the computer imputation operation. Those imputed in the first stage were flagged as "internal imputation" and those imputed in the second stage were flagged as "donor-based" imputation. Items imputed prior to the computer imputation were not flagged. In Round 3, flags distinguished between the stage or type of imputation: rational adjustment to the original entry, other internal imputation, donor-based imputation, and clerical imputation.

5.7.3 Weighting

The overall weights for teachers were developed in the same general way for each round. In Rounds 2 and 3 the weights were the products of six components; in Round 1 the last of these components was not used. The components are as follows:

- The *basic sampling weight* was the inverse of the teacher's overall selection probability, that is, the product of the school selection probability and the probability of selecting the sample teacher within the school.
- The *sample adjustment factor* accounted for unusual circumstances, such as mergers, splits or duplications, that had affected the school's probability of selection.
- The *school nonresponse adjustment factor* was designed to account for schools that did not provide teacher lists for sampling.
- The *teacher nonresponse adjustment factor* was designed to account for sample teachers for whom acceptable questionnaires were not obtained.
- The *frame ratio adjustment factor* was designed to reduce sampling error by adjusting sample estimates based on frame counts of teachers in sample schools to agree with the corresponding frame counts based on data for all schools.
- The *teacher adjustment factor* was used to force agreement between estimates of total number of teachers based on the School and Teacher Survey questionnaires. This adjustment factor was not used in Round 1.

Each of the last four factors was computed and applied within weighting cells comprised of schools or teachers with similar characteristics. Detailed descriptions of the weighting cells and the rules for collapsing them when necessary are provided in the *Sample Design and Estimation Reports* for each round (Kaufman, 1991, for Round 1; Kaufman and Huang, 1993, for Round 2; and Abramson et al., 1996, for Round 3). In Round 3, the frame ratio adjustment factor was not applied in BIA schools since teacher data were not available from the BIA school frame.

In a review of the teacher weights for Round 2, some of the CCD teacher counts used in the numerator of the frame ratio adjustment factor were found to be one-tenth of the correct values, possibly as a result of data keying errors. The problem was most severe in Iowa, and the teacher weights for that state were recomputed. The problem may have existed in other states, but, given the difficulty of identifying such cases and the late stage at which the problem was discovered, no other corrections were made (Kaufman and Huang, 1993).

Table 5-13 shows the median and the range of the teacher adjustment factors for both public and private school teachers. The maximum and minimum values for these adjustment factors were constrained by collapsing rules, which required that any cell with a factor outside the range from 0.667 to 1.500 be collapsed with another cell according to prescribed rules. For the majority of cells, the teacher adjustment factors were greater than 1.000, indicating that teacher counts

Table 5-13.—Adjustment factors applied to the teacher sampling weights, by sector: Round 2

Sector	Maximum	Minimum	Median
Public	1.498	0.711	1.074
Private	1.478	0.850	1.153

SOURCE: National Center for Education Statistics, SASS, Teacher Survey (1990-91)

reported in the School Survey exceeded the number of teachers included on the teacher listing forms for the same schools. Section 5.4.3 above discussed the studies that examined the discrepant teacher counts reported by the same school.

5.7.4 Variance estimation

For public school teachers, table 5-14 shows the estimates and their coefficients of variation (CVs) by state of the percent of teachers whose highest degree earned is a bachelor's degree, percent of teachers with less than 3 years of teaching experience, and the average total earned income in Round 3.

Overall 52 percent of public school teachers have a bachelor's degree as the highest degree earned, with a considerable variability across states from 20 percent in Connecticut to 79 percent in North Dakota. The CVs for the state estimates are generally under 5 percent, and all are less than 10 percent. Several of the larger CVs occur because of the small percent of teachers with a bachelor's degree as the highest degree earned in that state. With an overall rate of only 10 percent of teachers having less than 3 years of full-time teaching experience, the CVs for the state estimates for this percent are much larger, with two in five of them exceeding 10 percent. The CVs for average total earned income are all very small, with the largest being 1.7 percent.

Table 5-15 shows the corresponding estimates and CVs for private schools teachers by private school types. The CVs for the percent of teachers whose highest earned degree is a bachelor's degree are less than 5 percent for all school types except for special education schools. The percent of teachers with less than 3 years of full-time teaching experience is higher for private schools than public schools, a feature that tends to reduce the CVs. The CVs for this estimate for the various types of private schools are all less than 10 percent except for other religious unaffiliated schools and special education schools. The CVs for average total earned income are less than 5 percent except for other religious unaffiliated schools.

Generalized variance functions. Generalized variance functions (GVFs) provide a simple means to approximate sampling errors associated with survey estimates. They are useful for analysts who do not work with microdata files or lack the software for computing sampling errors for complex sample designs. For Round 2 of the Teacher Survey, Salvucci et al. (1995) provide GVFs for estimating CVs of teacher totals (e.g., number of male teachers), averages (e.g., average number of mathematics or computer science courses taken), and proportions (e.g., proportion of married teachers). They examined alternative GVF models for estimating CVs of estimates from the Teacher Survey and concluded that the model $CV=[A+B(X)]^{1/2}$ gave on

Table 5-14.—Coefficients of variation (CVs) for selected items for public school teachers, by state: Round 3

State	Highest degree earned was bachelor's degree	CV	Less than 3 years of full-time teaching	CV	Average total earned income	CV
	Percent	Percent	Percent	Percent	Dollar	Percent
Total	52	0.6	10	2.0	$35,228	0.3
Alabama	39	4.9	12	6.6	28,062	0.7
Alaska	59	1.8	8	8.0	46,903	0.4
Arizona	51	3.5	14	7.2	32,380	0.8
Arkansas	65	3.2	9	9.1	27,016	0.7
California	59	3.0	11	7.9	40,898	0.9
Colorado	47	3.6	10	8.7	33,118	1.0
Connecticut	20	5.8	6	11.3	48,905	0.7
Delaware	46	3.5	9	11.5	38,671	1.2
District of Columbia	41	4.3	12	12.8	43,108	1.4
Florida	57	2.0	9	10.7	32,389	0.9
Georgia	49	3.0	13	8.5	29,705	0.6
Hawaii	48	4.3	15	9.8	35,920	1.1
Idaho	74	2.1	10	11.2	27,420	1.1
Illinois	50	2.7	9	6.9	37,814	1.3
Indiana	21	8.1	6	14.1	36,695	1.0
Iowa	61	3.0	9	12.6	28,351	1.3
Kansas	54	2.6	11	6.9	30,501	0.8
Kentucky	23	9.3	9	15.2	31,519	0.9
Louisiana	61	2.6	10	8.4	24,923	0.6
Maine	68	2.8	6	15.4	30,649	1.0
Maryland	43	4.4	13	7.6	39,350	0.9
Massachusetts	39	3.2	7	8.6	38,340	0.5
Michigan	47	4.0	5	19.6	44,055	1.1
Minnesota	63	3.2	10	10.3	35,999	1.1
Mississippi	56	2.7	10	8.5	24,990	0.6
Missouri	54	3.7	9	10.1	29,216	1.6
Montana	71	1.9	10	6.2	27,591	0.8
Nebraska	62	2.7	7	9.4	26,859	1.7
Nevada	51	4.4	12	8.5	34,515	1.1
New Hampshire	60	3.3	7	12.4	34,159	1.2
New Jersey	56	5.1	7	14.4	46,735	1.6
New Mexico	53	3.0	13	8.3	27,513	0.7
New York	25	7.6	11	11.7	47,016	1.7
North Carolina	62	2.4	9	9.4	28,005	0.7
North Dakota	79	1.4	9	11.4	24,757	1.0
Ohio	53	4.1	7	11.7	34,814	1.1
Oklahoma	57	3.2	11	8.3	27,646	0.6
Oregon	52	3.8	6	14.7	34,893	1.1
Pennsylvania	47	4.9	7	15.6	41,844	1.0
Rhode Island	40	6.2	6	15.7	40,789	0.7
South Carolina	49	5.2	11	12.6	29,112	0.9
South Dakota	75	1.6	8	8.0	24,430	0.9
Tennessee	51	3.9	13	9.5	29,134	0.9
Texas	70	1.9	12	7.1	29,176	0.8
Utah	71	2.0	11	5.6	28,907	0.7
Vermont	49	3.6	8	14.2	34,016	1.3
Virginia	64	3.2	10	11.7	31,880	1.0
Washington	56	3.4	10	9.9	37,152	1.0
West Virginia	42	4.0	3	20.6	30,366	0.5
Wisconsin	59	2.8	8	12.5	36,448	0.9
Wyoming	71	1.3	7	8.9	30,005	0.8

SOURCE: CVs are computed using estimates and standard errors of estimates from Bobbitt, Broughman, and Gruber (1995).

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Table 5-15.—Coefficients of variation (CVs) for selected items for private school teachers, by school type: Round 3

School type	Highest degree earned was Bachelor's degree	CV	Less than 3 years of full-time teaching experience	CV	Average total earned income	CV
	Percent	Percent	Percent	Percent	Dollar	Percent
All private teachers	59	1.1	20	2.8	$22,739	0.9
Catholic	64	1.1	17	3.4	22,356	0.8
Parochial	71	1.2	18	4.7	20,058	0.9
Diocesan	62	2.2	16	4.8	22,720	1.1
Private order	45	3.5	18	9.5	28,426	1.8
Other religious	58	1.9	24	5.1	20,440	2.1
Conservative Christian	66	2.6	34	6.2	16,839	2.2
Affiliated	55	2.9	19	6.8	23,995	1.6
Unaffiliated	51	4.8	18	12.7	20,471	5.8
Nonsectarian	53	2.7	20	5.7	26,712	1.5
Regular	52	3.2	17	7.2	26,768	2.0
Special emphasis	55	3.9	28	8.6	25,431	2.7
Special education	54	7.8	22	17.8	27,763	3.4

SOURCE: CVs are computed using estimates and standard errors of estimates from Bobbitt, Broughman, and Gruber (1995).

average the best fit. The parameters of the GVFs (i.e., the values of A and B in the model) are provided by sector, region, region within sector, minority status within sector, and state (for public school teachers).

Variance estimation of imputed survey data. Zhang, Brick, Kaufman, and Walter (1998) conducted an empirical study of variance estimation taking account of the imputations in the Round 3 teacher questionnaires. They applied Shao and Sitter's (1996) bootstrap variance estimation method and found that when the stage 2 donor-based imputation rate is high (above 10 percent), the increase in the estimated standard error can be large compared with the standard error computed by treating the imputed values as reported values, especially for categorical variables. When the imputation rate is low, the increase in standard error is not severe. In Round 3, there were relatively few items that had high stage 2 imputation rates (only 11 out of 249 items from the public school teacher questionnaire). The authors suggest that data users might be provided with standard error estimates that take account of the imputed values for estimates of totals and means; users could then use these standard error estimates to develop adjustment factors when estimating standard errors of other estimates.

5.8 EVALUATION OF ESTIMATES

This section describes comparisons of Teacher Survey estimates with data from other sources, including the School Survey, the CCD, and to a limited extent, data available from other sources.

Some of these comparisons were made as part of prepublication reviews; others were made subsequent to publication.

Round 1 evaluations. Prior to publication of Round 1 results, estimates of full-time equivalent (FTE) teachers by state based on the Teacher Survey were compared with estimates from the School Survey. As noted earlier, for most states the Teacher Survey estimates were lower, reflecting the fact that the number of teachers listed by the school on the form used to sample teachers was often less than the count of teachers reported for the same school in the School Survey. In addition, there was evidence that many schools provided counts of FTE teachers that were too high. In the average state, 19 percent of the schools with some part-time teachers reported the same counts for total and FTE teachers (Choy, Medrich, Henke, and Bobbitt, 1992). The extent of this phenomenon varied by state, from 10 percent in Alaska and Hawaii to 31 percent in Colorado (Kaufman, 1990). Consideration was given to the possibility of adjusting the Teacher Survey estimates to force agreement with CCD counts, but such an adjustment would not have resolved the discrepancies between the FTE teacher counts from the School and Teacher Surveys.

The Round 1 Teacher Survey estimate of average hours spent in a week on school and school-related activities (40.3 hours) proved to be substantially below the corresponding estimate from the 1985 Public School Survey (50.4 hours). There were several differences between the two surveys in the questionnaire items used to produce these two estimates. In addition, the Round 1 Teacher Survey estimates may have been low because there was no imputation when responses were provided for some but not all of the relevant items. On the basis of this comparison, it was decided that no data on this topic would be published or included in the public-use microdata files (Hammer, 1990).

Teacher Survey estimates of salary were compared with data available from private organizations. The Teacher Survey estimate of average base salary for public school teachers was $26,231, somewhat below the average salary ($28,071) reported by the American Federation of Teachers (Nelson, 1990) and the National Education Association (1990). The higher figures from the latter two sources are believed to result from the inclusion, by some states, of other kinds of instructional expenditures in the category that covers teachers' salaries (Choy et al., 1992; Fowler, 1990).

Round 2 evaluation of estimates. The use of a teacher adjustment factor as one component of the Teacher Survey weights for Round 2 guaranteed that teacher estimates from the Teacher and School Surveys would agree for each of the weighting cells. However, as described in more detail in section 2.7, comparisons of School Survey public school FTE teacher estimates with counts from the CCD showed that the School Survey estimates for nine states were at least 15 percent higher than the CCD counts. Investigation of this problem led to a series of additional processing and reweighting steps to make SASS state estimates of the number of public schools more consistent with the CCD counts and to make enrollment and teacher count data consistent with the CCD on a school-by-school basis. These steps included reclassifying as out of scope teacher file records for teachers who taught only grades that were no longer considered part of a sample school and reinstating records for teachers at sample schools previously classified as out of scope because of apparent mergers (Fondelier, 1992).

Final School Survey estimates, by state, of FTE teachers were compared with counts from the 1990-91 CCD. At the national level, the SASS estimates exceeded the CCD count by 2.8 percent. The SASS estimates for South Dakota and Wisconsin were 31.7 percent and 17.1 percent, respectively, above the CCD counts for those states. For 9 states, differences were in the range from 10 to 15 percent, with SASS being higher in all 9 states. For all other states, differences were less than 10 percent. The SASS and CCD data by state are shown in chapter XII of the Round 2 *Data File User's Manual* (Gruber, Rohr, and Fondelier, 1993).

Round 3 evaluation of estimates. In Round 3 a comparison was made by state between the number of public teachers estimated from the Teacher Survey and the CCD State Nonfiscal Survey (see table 5-16). This comparison was conducted to spot gross errors since there are several reasons why the number of teachers, in FTE counts, estimated from the Teacher Survey would differ from CCD's State Nonfiscal Survey counts. The CCD counts are statewide official tallies of teachers, reported from a central agency, and unduplicated to account for teachers in multiple districts or schools. The Teacher Survey depends in part upon the cooperation of the schools to provide a list of all teachers and the survey population is constrained by the operational procedures for the survey (see section 5.2). For example, if a teacher is out on maternity leave or has taken another job in some other school when sampled, the questionnaire is declared out of scope, since the designated teacher is not available; however, from the state's point of view, there is still a teaching position at the sampled school. Also, when a sample school is declared out of scope, such as for merging with another school that is not in sample, the teachers that were selected for sample are also out of scope. While such factors affect relatively small proportions of the sampled cases, there may be a cumulative effect on the overall count of teachers in some states.

At the national level, the Teacher Survey estimate of the number of FTE teachers was slightly more than 2 percent lower overall than the CCD count. In the following 11 states, the Teacher Survey estimate was at least 4.5 percent higher than the CCD count: Alaska, Arkansas, Delaware, Hawaii, Iowa, Kentucky, Missouri, Montana, Pennsylvania, Wisconsin, and Wyoming. In 6 states—Alaska, Arkansas, Kentucky, Montana, Pennsylvania, and Wisconsin—the Teacher Survey estimate of FTE teachers was higher than the CCD count. SASS and CCD data by state are shown in table XII-9 of the Round 3 *Data File User's Manual* (Gruber, Rohr, and Fondelier, 1996).

Table 5-16.—Full-time equivalent (FTE) teachers in public schools from the Round 3 SASS Teacher Survey and the 1993-94 Common Core of Data (CCD) State Nonfiscal Survey, by state

State	FTE teachers CCD	FTE teachers SASS	SASS/CCD (percent)
50 states and D.C.	2,505,074	2,452,057	98
Alabama	43,002	43,660	102
Alaska	7,193	7,806	109
Arizona	37,493	35,779	95
Arkansas	26,014	29,698	114
California	221,779	203,711	92
Colorado	33,661	33,809	100
Connecticut	34,526	33,438	97
Delaware	6,380	6,841	107
District of Columbia	6,056	5,149	85
Florida	110,653	104,225	94
Georgia	75,602	72,763	96
Hawaii	10,111	10,609	105
Idaho	12,007	11,467	96
Illinois	110,874	106,172	96
Indiana	55,107	55,170	100
Iowa	31,616	33,159	105
Kansas	30,283	28,629	95
Kentucky	37,324	40,002	107
Louisiana	46,913	47,649	102
Maine	15,344	14,478	94
Maryland	44,171	41,152	93
Massachusetts	58,766	53,407	91
Michigan	80,267	79,388	99
Minnesota	46,956	41,081	87
Mississippi	28,376	29,172	103
Missouri	54,543	59,577	109
Montana	9,950	12,106	122
Nebraska	19,552	18,870	97
Nevada	12,579	12,444	99
New Hampshire	11,972	11,331	95
New Jersey	84,564	80,459	95
New Mexico	18,404	18,742	102
New York	179,413	171,571	96
North Carolina	69,421	68,437	99
North Dakota	7,755	7,564	98
Ohio	107,444	106,832	99
Oklahoma	39,031	40,699	104
Oregon	26,488	23,871	90
Pennsylvania	101,301	108,074	107
Rhode Island	9,823	8,565	87
South Carolina	38,620	38,599	100
South Dakota	9,557	9,931	104
Tennessee	46,066	46,081	100
Texas	224,830	219,133	97
Utah	19,053	19,038	100
Vermont	8,102	6,692	83
Virginia	70,220	62,374	89
Washington	45,524	45,906	101
West Virginia	21,029	20,251	96
Wisconsin	52,822	59,437	113
Wyoming	6,537	7,059	108

SOURCE: Gruber, Rohr, and Fondelier (1996).

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6. THE TEACHER FOLLOWUP SURVEY

6.1 INTRODUCTION

The Schools and Staffing Surveys' (SASS) Teacher Followup Survey (TFS) is conducted in the school year following the basic SASS surveys (i.e., Round 1 in 1988-89, Round 2 in 1991-92 and Round 3 in 1994-95). Information is collected from a subset of the teachers who responded to the Teacher Survey in the base school year (i.e., Round 1 in 1987-88, Round 2 in 1990-91 and Round 3 in 1993-94). On the basis of inquiries to their schools early in the following school year, teachers who responded in the base year are classified into three categories: *Leavers*, those who left the teaching profession between the base year and the following year; *Movers*, those who moved to a different school between the base year and the following year; and *Stayers*, those teaching in the same school in both years. The stayers and movers are referred to collectively as *current* teachers and the leavers as *former* teachers. The sample for the TFS consists of all of the former teachers and a subset of the current teachers, with a different questionnaire administered to teachers in each of these two groups.

The main purposes of the TFS Survey are the following:

- Measure attrition rates for elementary and secondary teachers, by type of school and by state;
- Determine and compare the characteristics and attitudes of leavers, movers, and stayers;
- Determine the current economic activities of leavers;
- Collect data on attitudes about the teaching profession and job satisfaction; and
- Obtain data on educational activities and future plans for all groups.

This chapter has the same organization as preceding chapters. It has sections covering the main phases of the survey operations: sampling frames (6.2), sample design (6.3), content (6.4), data collection procedures (6.5), data processing (6.6), measurement error (6.7), nonresponse (6.8), and estimation (6.9). Because of the lack of data availability for comparisons, there is no section on evaluation of estimates.

6.2 SAMPLING FRAMES

The TFS has the same target population as the Teacher Survey—that is, regular full-time or part-time teachers during the base school year whose primary assignment was teaching in kindergarten or any of grades 1 to 12 in a school that was eligible for the School Survey. Also included are persons who, in the base year, were substitutes filling the role of a regular teacher on a long-term basis or itinerant teachers (those teaching regularly in more than one school); such persons were also included in the Teacher Survey. Details about the selection of the sample of schools for the School Survey and the sample of teachers from those schools for the Teacher Survey can be found in chapters 2 and 5, respectively.

The TFS sampling frame consisted of all eligible teachers who had responded to the Teacher Survey conducted in the previous year. Teachers who had not responded to the Teacher Survey were excluded because of the absence of base-year information for them, thus limiting the utility of their TFS responses for analysis.

Evaluation of the sampling frame. The overall coverage of the target population for the TFS depends in large part on the completeness of coverage of the frames used for the base-year School and Teacher Surveys. Evaluation of those frames is discussed in chapters 2 and 5, respectively. The proportion of the target population for the TFS covered by its sampling frame was further reduced by the exclusion of teachers in schools not providing teacher lists for the Teacher Survey and by nonrespondents to the Teacher Survey. The loss from schools not sending in teacher lists was fairly constant across rounds for both public and private schools, at between 4 and 5 percent for public schools and at least double that for private schools. The loss due to teacher nonresponse in schools that sent in teacher lists was larger, at about 10 percent for the public sector and about 20 percent for the private sector.

6.3 SAMPLE DESIGN

A primary sample design objective for the TFS is to support comparative analyses of stayers, movers, and leavers for teachers classified by sector (public and private), level (elementary and secondary), and years in teaching (new and experienced). Large majorities of teachers in all categories are stayers. Consequently, movers and leavers have been oversampled in order to reduce the sampling errors of estimated differences among groups. As mentioned in section 5.4.2, in all rounds new teachers in private schools were oversampled for the Teacher Survey to ensure a sufficient sample of teachers in this category for the TFS.

In order to achieve the above design objective, the sample of respondents to the Teacher Survey was grouped into 24 strata formed by the cross-classification of school sector (public or private), level (elementary or secondary), teaching experience (new or experienced), and status (leaver, mover, or stayer). Apart from status, all these variables were available from the Teacher Survey.

Information to classify responding teachers in the Teacher Survey as leavers, movers, or stayers was obtained by asking school principals for the teachers' current occupational status. This classification activity was initiated with an advance letter being sent to school districts in late summer/early fall in all rounds. This letter thanked the district for its participation in SASS in the previous year, introduced the TFS and its importance, and notified the district that the U.S. Census Bureau would soon be contacting schools in the previous year's survey for the current employment status of the sampled teachers. School principals were then sent a Teacher Status Form on which they (or other knowledgeable school staff members) were asked to report for each teacher who had participated in the Teacher Survey whether the teacher was still at the school in a teaching or nonteaching capacity, had left the school to teach elsewhere, or had left the school for a nonteaching occupation. The Teacher Status Form was mailed to principals in the fall of the year following the Teacher Survey (in October, 1988, for Round 1; in September, 1991, for Round 2; and in September, 1994, for Round 3). In Round 3, reminder postcards were sent to schools shortly after the Teacher Status Form mailing. In all rounds, schools that had not responded within about one month were telephoned to collect the information requested for the teachers listed on the forms. If a school did not respond, all its sampled teachers were classified

as stayers, since that is the predominant status. In the few cases where a school responded but did not specify a teacher's current status, the teacher was classified as a leaver for sample selection purposes. Since leavers were sampled at the highest rate, this procedure ensured that such teachers were sampled at a rate not lower than the rate of the group to which they truly belonged.

Sample allocation. For all three rounds, the sample size for the TFS was about 7,200 teachers, consisting of about 5,100 public school teachers and 2,100 private school teachers. These totals were allocated among the 24 strata defined above in a way that produced a sufficient sample of teachers in each stratum to permit comparisons across strata (for example, to compare the proportion of former teachers among new elementary school teachers in public schools with the corresponding proportion in private schools). The allocation to all 24 strata can be found in the *TFS User Manuals* or technical notes of other publications for each of the three rounds (Bobbitt, Faupel, and Burns, 1991; Whitener, Kaufman, Rohr, Bynum, and King, 1994; Whitener, Gruber, Rohr, and Fondelier, 1999). Rounds 2 and 3 used exactly the same allocation. Thus, for example, in these rounds the allocation yielded overall about 2,400 new and 4,800 experienced teachers, and about 2,300 former and 4,900 current teachers. Round 1 selected more former teachers (about 3,000) and correspondingly fewer current teachers (about 4,200).

Sample selection. For all of the leaver strata and some of the mover strata, it was necessary to include all Teacher Survey respondents in the TFS sample in all three rounds. In each of the strata for which a subsample of the Teacher Survey respondents was to be selected, the responding sample teachers were sorted in a specified order before the selection was made. The sorting variables and their order of application changed from year to year for both sectors, as shown in table 6-1. The samples for the TFS were then selected by systematically sampling within strata, with the ordering of the lists giving the benefit of implicit stratification.

Table 6-1.—Variables used in ordering teacher lists, by sector: Rounds 1-3

Round 1 (1988-1989)		Round 2 (1991-92)		Round 3 (1994-95)	
Public	Private	Public	Private	Public	Private
Census region	Association	Teacher subject	Teacher subject	Teacher subject	Teacher subject
Urbanicity	Urbanicity	Census region	Affiliation	Census region	Association/ Affiliation[1]
Teacher subject[2]	Teacher subject	Urbanicity	Urbanicity	Urbanicity	Urbanicity
School enrollment	School enrollment	School enrollment	School enrollment	School enrollment	School enrollment
		SASS teacher control number	SASS teacher control number	SASS teacher control number	SASS teacher control number

[1]Association group for the list frame, affiliation group for the area frame.
[2]For elementary teachers, teacher subject refers to general elementary, special education, or other. For secondary teachers, teacher subject refers to math, science, English, social studies, vocational education, special education, or other.
SOURCES: Bobbitt et al. (1991); Whitener et al. (1994); Whitener et al. (1999).

The teachers were sampled within strata with unequal selection probabilities, with the aim of making the TFS sample in each stratum more nearly self-weighting than the Teacher Survey sample. In all three rounds, teachers were sampled by probability proportional to size sampling, but the measure of size changed somewhat across rounds: For Round 1 the measure of size was the basic weight for the Teacher Survey sample (i.e., the inverse of the selection probability); in Round 2, it was the intermediate teacher weight that included the sampling adjustment factor, the school nonresponse adjustment factor, and the ratio adjustment factor (see section 5.7.3); in Round 3, it also incorporated the teacher noninterview factor. The measure of size changed for each round depending on the status of the SASS teacher weighting process for each round. At the time the TFS sample had to be selected, as many as possible of the SASS teacher weighting factors that were available were used in this measure of size and this varied for each round.

In some cases the status of teachers, as determined from their TFS responses, differed from the status reported for them on the Teacher Status Forms that were used in sampling. Such differences could result from changes in status during the school year, from reporting errors on the Teacher Status Forms, from an incorrect assignment of stayer or leaver status to teachers whose current status was unknown, or from reporting errors on the TFS questionnaires. Differences of the first three kinds do not bias the survey estimates, but they lead to a less efficient sample. In particular, a problem arises when leavers or movers are incorrectly classified as stayers, in which event they receive basic weights substantially greater than those of other teachers in their categories. Incorrect reporting of status on the TFS questionnaire, of course, causes bias in the survey estimates.

6.4 CONTENT

The TFS questionnaires (one for current teachers and one for former teachers) collect information to measure attrition rates; to compare leavers, movers, and stayers; to determine the current economic activities of leavers; to obtain data on educational activities and future plans for all groups; and to collect data on attitudes about the teaching profession and job satisfaction. It has been suggested that the TFS provides the best national database available for monitoring year-to-year flows of teachers, as well as a vehicle for tracking actual teacher career transitions (as distinct from teacher reports of activities in the prior year, and plans for the coming year) (Ingersoll, 1995; Boe, 1996).

The subjects covered by the current and former teacher questionnaires are as follows (Salvucci et al., 1997):

Current Teacher Questionnaire:

- Primary occupational status (full time, part time)
- Primary teaching assignment by field
- Teaching certificate
- Level of students taught
- School community type
- Expected duration in teaching

Former Teacher Questionnaire:

- Primary occupational status (full time)
- Type of business
- Primary activity
- Time planning to spend in current job
- Reasons for leaving teaching
- Plans for returning to teaching

Current Teacher Questionnaire (continued):

- Reasons for leaving previous school (movers only)
- Level of satisfaction
- Possible areas of dissatisfaction
- New degrees earned or pursued
- Marital status
- Number of children
- Academic year base salary
- Combined family income

Former Teacher Questionnaire (continued):

- Possible areas of dissatisfaction
- New degrees earned by type and field
- Marital status
- Number of children
- Salary
- Combined family income

The TFS questionnaires for all rounds also asked for information that would facilitate further recontacts with the sample teacher. This information was requested because of the interest in developing a longitudinal study of teachers' careers. Singer and Willett (1996) discuss methodological issues in the design of a longitudinal study of teachers. They recommended a followup period for beginning teachers of at least 12 years with at least 6 equally spaced waves of data collection. NCES was also encouraged to consider additional brief annual contacts to ensure that essential data on the intervening years could be reliably obtained. However, there have been no further recontacts of these TFS samples.

Content changes. Some changes have been made to the wording and order of specific items from one round to the next. Additionally, in Round 2, for items common to both the TFS and the Teacher Survey, the wording of the TFS item was changed to be consistent with the Teacher Survey item. In Round 3, there were very few items asked on both surveys so this practice was minimized. In Round 3, a new section consisting of about 20 items was added to the current teacher questionnaire to collect data on teaching methods. Using data from these new questions, a report by Henke, Chen, Goldman, Rollefson, and Gruber (1999) examined teachers' practices in four areas of instruction: the roles that teachers and students play in learning activities, the materials and technology used in the classroom, the kinds of learning tasks that students do both in the classroom and at home, and how teachers assess and evaluate student learning.

6.5 DATA COLLECTION PROCEDURES

Data collection for the TFS was initially by mail, with the questionnaires being sent to the sampled teachers' home addresses. In preparation for this mailing, the Teacher Survey questionnaire collected the home addresses for the teachers in that survey, together with contact information for two persons who would know how and where to get in touch with the teachers. Teacher Followup questionnaires were mailed to sampled teachers in March 1989 for Round 1, in January 1992 for Round 2, and in January 1995 for Round 3 (Bobbitt et al., 1991; Whitener et al., 1994; Whitener et al., 1999). In all rounds, teachers who were sent questionnaires that were inappropriate for their status (current or former teachers) were asked to return them so that the correct version could be sent to them. A second questionnaire was mailed about 4 to 5 weeks later to teachers who had not responded by that time. In Round 3, only 34 percent of stayers and 19 percent of leavers had responded to the initial mailing before the second mailing occurred. The final mail return rates were 44 percent for stayers, and 28 percent for leavers (Cole, Parmer and Schwanz, 1997).

In all three rounds, nonrespondents to the mail questionnaires were interviewed by telephone by U.S. Census Bureau field representatives in regional offices using paper-and-pencil instruments. A single version of the questionnaire designed to accommodate both current and former teachers was used (Faupel, Bobbitt and Friedrichs, 1992; Whitener et al., 1994; Whitener et al., 1999). Telephone interviewing took place in May-July, 1989 for Round 1, April-May, 1992 for Round 2, and March-May, 1995 for Round 3, with the earlier dates for later waves reflecting a desire to initiate followup as early as possible. The interviewers also tried to contact teachers for whom questionnaires had not been mailed because of an incomplete mailing address or because no current mailing address had been obtained. If interviewers were unable to contact a sample teacher through a contact person or through the use of telephone directory assistance, calls were then placed to the school where the teacher had been teaching in the base year in an attempt to collect contact information.

In Round 3, responses were obtained from about 89 percent (unweighted) of the teachers sampled for the TFS. Given the low level of response to the mailout effort, this rate indicates the importance of and the success achieved by the telephone followup efforts.

6.6 DATA PROCESSING

Data processing procedures for all three rounds of the TFS were similar to those used in the basic SASS surveys. The main steps were a general clerical edit to check for out of range values, data keying, computer pre-edit (range checks on priority items and consistency checks between selected items), a review and correction of rejects from the computer pre-edit (only in the first two rounds), a computer edit, and the assignment of a final status to the questionnaire. The computer edit included range checks, inter-item consistency checks and a blanking operation to eliminate items that respondents answered unnecessarily because they did not follow skip instructions correctly. In Round 2, 9 percent of the 4,818 stayer questionnaires and 23 percent of the 2,014 leaver questionnaires failed the computer pre-edit. Clerks reviewed the questionnaires to verify the data keying accuracy and attempted to resolve the reject items. For certain cases, the clerk was required to call the respondent to resolve critical inconsistencies or to obtain critical data.

There were some exceptions to the above flow of data processing in Round 3. Within the clerical edit, former teacher questionnaires were also assigned industry and occupation codes to reflect the respondent's current job. Also, for current teacher respondents teaching in a new state, a Federal Information Processing Standards (FIPS) code was assigned for that state. A preliminary interview status was assigned after the clerical edit and before the computer edit. Data entry personnel were instructed to correct all errors identified during keying and to refer problem cases to their supervisor. One hundred percent independent verification was done. In Round 3, the pre-edit was incorporated into the clerical edit.

6.7 MEASUREMENT ERROR

Reinterviews were conducted in all rounds to obtain some indication of measurement error for the TFS. Reinterview sample sizes of current and former teachers, and overall response rates are presented in table 6-2.

Table 6-2.—Reinterview sample sizes and response rates for current and former teachers: Rounds 1-3

Category	Round 1 (1988-89)	Round 2 (1991-92)	Round 3 (1994-95)
Total	1,500	1,498	1,545
Current teachers	750	708	1,545
Former teachers	750	790	0
Response rate (percent)	81	92	63

SOURCES: Jenkins and Wetzel (1995); Salvucci et al. (1997); Bushery, Schreiner, and Newman-Smith (1998).

Overall the reinterview sample size was around 1,500 at each round. In the first two rounds, the sample size was divided fairly evenly between current and former teachers, but in Round 3 only current teachers were reinterviewed because of the desire to focus on the new instructional practices questions asked for current teachers. Additionally, only current teachers who were *not* reinterviewed for the Round 3 Teacher Survey were selected for the TFS reinterview. This practice was not followed in the previous two rounds. The reinterview sample was selected at the same time as the TFS sample in all rounds (Bushery et al., 1998).

In Rounds 1 and 2, all reinterviews were conducted by telephone. When the TFS data were collected by phone interview, the interviewer who conducted the original interview also conducted the reinterview. In Round 1, for teachers who responded by mail prior to the cutoff date, the reinterviews were conducted by telephone from the U.S. Census Bureau's Hagerstown, Maryland, Telephone Center. For all other teachers, U.S. Census Bureau field representatives conducted the reinterviews by telephone from regional offices (Jabine, 1994). In Round 2, the reinterviews were conducted about 2 to 3 weeks after the original interviews by supervisory field representatives. For Round 3, the mode of collection for the reinterview replicated the mode of collection for the original interview (Bushery et al., 1998). The reinterviews for mail respondents were conducted 3 to 4 weeks after the completion of the original response; if no response was obtained within 3 weeks of the reinterview mailing, a second reinterview questionnaire was mailed. There was no telephone followup of mail reinterview nonrespondents because it was felt that mode made a difference. Telephone reinterviews were conducted on a flow basis using a paper- and pencil-questionnaire. U.S. Census Bureau field representatives completed the original TFS questionnaires and mailed them to regional offices; the regional offices then prepared and mailed reinterview questionnaires to senior U.S. Census Bureau local field representatives to conduct the telephone reinterviews.

The response rate for the Round 3 reinterview was low at 63 percent, despite the good response rate of 71 percent by mail; the response rate for telephone cases was only 54 percent. To increase the telephone response rate, Bushery et al. (1998) have proposed that in the future the telephone reinterviews be carried out from telephone centers rather than by local field representatives.

In each of the first two rounds, two reinterview questionnaires were used—one for current teachers and one for former teachers. Although the Round 3 TFS reinterview program was confined to current teachers, it also used two different reinterview questionnaires—one for mail respondents and one for telephone respondents (Whitener et al., 1999). In all three rounds the reinterview questionnaires contained a subset of questions from the original questionnaire that NCES deemed critical, that were suspected to be problematic, or were new questions not previously evaluated. The Round 1 current teacher reinterview questionnaire contained 32 items, mostly addressing teachers' opinions, attitudes, and expectations, and the former teacher reinterview questionnaire contained 24 items (Salvucci et al., 1997). The Round 2 reinterview questionnaire contained 42 items for current teachers covering subject areas such as employment and teaching status, incentives and compensation, and background information; the former teacher reinterview questionnaire for the same round contained 21 items including questions on employment status, educational activities and future plans, and background information (Jenkins and Wetzel, 1995). In Round 3, the reinterview included many questions from the new teaching methods section (Bushery et al., 1998).

The objectives of the reinterview program differed across survey rounds. For Rounds 1 and 3, the objective was simply to measure the degree of variability between the original responses and the reinterview responses (Whitener et al., 1999). The procedures used in the Round 2 reinterview program were more extensive than those used in the other two rounds, in that they included a reconciliation component that aimed to determine the reasons for differences between the original and reinterview responses (Jenkins and Wetzel, 1995).

In Round 2, all reinterview questions were asked before any reconciliation questions. After completing the reinterview questionnaire, interviewers were instructed to go back to the beginning of the questionnaire and to compare the respondent's reinterview responses recorded on the left hand pages with the original responses, which had been recorded on the right hand pages of the reinterview questionnaire. When differences were detected between the original response and the reinterview response, reconciliation was attempted through a series of closed-ended probes tailored to each reinterview question (printed on the questionnaire) that aimed to identify the reasons for the differences (Harris, 1992a,b). An open-ended probe was used if a respondent did not choose one of the closed-ended probes. The open-ended responses were reviewed and clerically coded prior to data entry. The responses to the TFS were clearly visible to the interviewers as they conducted the reinterviews, and thus may have influenced the responses recorded to the reinterviews. This type of reinterview is known as a dependent interview (Jenkins and Wetzel, 1995).

Round 1 reinterview results. When asked in reinterviews to report their status *at the time they responded to the initial TFS interview*, 83 (7 percent) of the teachers reinterviewed reported a status different than the one that they had reported in the initial interview. Of these 83 teachers, 20 changed from current teacher in the initial interview to former teacher in the reinterview and 63 changed from former to current teacher. No attempt was made to reconcile these differences in the reinterview. Because different sets of questions were asked for current and former teachers, those who reported a different status in the reinterview were excluded from further analyses of the questionnaire items included in the reinterviews (Royce, 1990).

Table 6-3 shows the distribution of estimated indexes of inconsistency for all items included in the TFS reinterviews in Round 1, separately for current and former teachers (see section 2.6.3 for a description of the index of inconsistency). Most of the reinterview items for former teachers dealt with the teachers' opinions, attitudes and expectations. For current teachers there was a more nearly equal division between factual and opinion items.

Table 6-3.—TFS reinterviews, by type and index of inconsistency: Round 1

	Current (movers and stayers)		Former (leavers)	
Index of inconsistency[1]	Factual	Opinion	Factual	Opinion
Total questions	19	13	2	22
Low (0-19%)	3	0	1	0
Moderate (20-50%)	4	1	1	7
High (51-100%)	2	8	0	13
Not available[2]	10	4	0	2

[1] For items with more than two response categories, the L-fold index of inconsistency was estimated.
[2] Did not meet the minimum requirements to compute a reliable estimate of the index of inconsistency.
SOURCE: Royce (1990).

Most of the factual items had indexes in the low or moderate ranges. The two factual items for current teachers that had high indexes of inconsistency related to teacher certification in the fields of their primary and secondary teaching assignments. The majority of opinion items had indexes of inconsistency in the high range and none of them were in the low range.

Former teachers were asked to rate their current occupations on several aspects of job satisfaction both in an absolute sense and relative to teaching. Table 6-4 compares the indexes of inconsistency estimated for the absolute and relative ratings. Even though the indexes were in the moderate to high range for all items, respondents were clearly more consistent in providing comparative ratings on a three-point scale than they were in providing absolute ratings on a four-point scale.

For items on current teachers' satisfaction with their jobs and on former teachers' satisfaction with their current jobs, all of which used a four-point scale, indexes of inconsistency were re-estimated with the four response categories collapsed into two: satisfied and dissatisfied. The resulting indexes were lower in all instances and in many cases moved from the high to the moderate range. As a result of these findings, the data from these items have generally been presented in the collapsed form in publications.

Special analyses were conducted for the components of income reported by current teachers. These analyses showed, for those who reported non-zero amounts on both occasions, a correlation of 0.95 for reports of base salary. For other components the estimated correlations were much lower: 0.22 for non-teaching compensation and -0.39 for summer school salary.

Table 6-4.—TFS index of inconsistency for selected opinion items, for former teachers: Round 1

Aspect of current occupation rated	Index of inconsistency when: Rated for current occupation[1]	Current occupation compared to teaching[2]
Salary		
Point estimate	[3]63	[3]37
90% confidence interval	54-74	30-48
Opportunities for professional advancement		
Point estimate	63	56
90% confidence interval	54-75	47-70
Autonomy or control over your own work		
Point estimate	[3]79	[3]53
90% confidence interval	69-92	43-65
Benefits		
Point estimate	[3]65	[3]38
90% confidence interval	56-76	31-48
Intellectual challenge		
Point estimate	[3]60	[3]43
90% confidence interval	51-72	35-53

[1]Question 27: How satisfied are you with EACH of the following aspects of your CURRENT job? Are you (a) Very satisfied, (b) Somewhat satisfied, (c) Somewhat dissatisfied, or (d) Very dissatisfied with—

[2]Question 26: How would you rate teaching relative to your current PRIMARY occupation in terms of EACH of the following aspects? Please indicate (a) Better in teaching, (b) Better in current position, or (c) No difference—

[3]Statistically significant difference between absolute and comparative ratings (at a 10 percent significance level).

SOURCE: Royce (1990).

Round 2 reinterview results. The Round 2 reinterview program for the TFS involved reinterviews followed by a reconciliation of any differences in responses. The reinterview data can be analyzed for consistency of response with the original data using the index of consistency as in Round 1. Indexes of inconsistency were computed for 35 of the 42 items on the current teacher reinterview questionnaire (the other 7 items had too few cases to produce a reliable index) and for 15 of the 21 items on the former teacher reinterview questionnaire (Jenkins and Wetzel, 1995). All the items on both questionnaires were factual items. Two items on each questionnaire had indexes in the moderate range; all the others were in the low range. The two items in the moderate range on the current teacher questionnaire asked teachers to categorize their teaching assignment as regular, itinerant, or long-term substitute, and whether or not the teacher had a teaching certificate in their other teaching assignment field. The two items on the former teacher questionnaire asked about total combined income (in income categories) and persons other than spouse or children who depended on the respondent for more than half of their financial support.

The indexes of inconsistency in Round 2 were much lower than those in the previous round. Moreover, the consistency of response was significantly greater in Round 2 than in Round 1 for all but two of the 14 items that the two reinterview programs had in common. The before-reconciliation gross difference rates (the percent of respondents with different responses in the original interview and the reinterview) were significantly lower in Round 2 then in Round 1 for 12 of the items (Jenkins and Wetzel, 1995).

Jenkins and Wetzel (1995) suggest several possible reasons to explain the greater consistency in Round 2. A probable cause is the reconciliation component of the Round 2 reinterview program, with dependent interviewing. In some cases, the interviewers may have been influenced by the original responses in conducting the reinterviews, thus creating greater consistency. Inadequate interviewer training may have contributed to this behavior.

As a result of the higher level of consistency of responses in Round 2, the reconciliation component of the reinterview program was able to identify only a limited number of reasons for observed differences. These reasons included misunderstanding the question, manual/general errors, category problems, and misunderstanding of the reference period. Given the limited success of the reconciliation component and its expense, it was not retained for Round 3.

Results from the Round 2 reinterview and reconciliation process led to recommendations to rearrange and reword the answer categories for a question on the current teacher questionnaire concerning the type of teacher (regular, part-time, itinerant, etc.), and to rearrange the order of some questions on that questionnaire (Jenkins and Wetzel, 1995). However, these recommendations were not adopted in the following round because of insufficient time to test the changes before implementation.

Round 3 reinterview results. The Round 3 reinterview program was confined to current teachers. Further, since the reinterview sample was not designed to measure mode effects, response variance measures were not computed separately for telephone and mail cases. Indexes of inconsistency were calculated for 65 questions; of these 51 (78 percent) displayed high levels of inconsistency, and only 3 (5 percent) displayed low levels (Bushery et al., 1998). Two questions were especially problematic. One asked whether the teacher's time was equally divided between two of several listed activities (e.g., teaching in an elementary or secondary school, working in such schools with an assignment other than teaching, working in an occupation outside of elementary or secondary school). This question had an index of inconsistency of 67. The second question, asking about the teacher's main activity during the work week, had an index of inconsistency of 62. These questions had been revised from those used in the 1991-92 TFS, but the new format remained problematic.

The 1994-95 reinterview program again confirmed that "mark all that apply" questions are problematic. There were eight parts to a question that asked the teacher to describe characteristics (e.g., homogeneous, heterogeneous, remedial, gifted, special education, etc.) of his or her designated class; six had high response variance, and two had moderate response variance. Unclearly defined response categories may have exacerbated the usual problems of "mark all that apply" questions.

In the main activity section, the questions regarding teacher assignments and certificates showed the same problems as previously found in the Round 3 Teacher Survey reinterviews (Bushery, Schreiner, and Sebron, 1998). Further, all but one of the 54 questions on teaching methods, many of which were new, had moderate or high response variance.

The Round 2 and Round 3 reinterview programs for current teachers had five questions in common. For all of these, the index of inconsistency was lower in Round 2 than in Round 3. This finding is similar to that found in comparing the consistency of response between Rounds 1 and 2. The explanation is probably a lack of independence of the initial and reinterview responses caused by dependent interviewing in the Round 2 reinterview program.

Several recommendations for changes to the questionnaires were made based on the Round 3 reinterview results (Bushery et al., 1998) including the following:

- Reconsider the objectives for the main activity questions and redesign the questions and test them. Cognitive researchers should participate in this work. At a minimum, "work week" should be defined more precisely to help focus respondents on the objective.
- Use "yes/no" response formats rather than the "mark all that apply" format.
- Test and reinterview revised questions to determine if reliability has improved.

6.8 NONRESPONSE

Unit nonresponse. Unit nonresponse to the TFS can arise at three stages: in obtaining teacher lists from schools; in obtaining response in the Teacher Survey from the selected sample of listed teachers; and in obtaining response in the TFS from a sample of those who responded in the Teacher Survey.

Initially we consider the unit response rate associated with the last of these stages, that is, the percent of teachers selected from the Teacher Survey respondents who responded to the TFS. This response rate, which is termed the conditional TFS response rate, is displayed in table 6-5 for all rounds, separately by sector and by status (current or former teacher).

As the table shows, responses were obtained for the TFS in Rounds 1 and 2 from more than 90 percent of the teachers selected in all categories. Round 3 had lower response rates than the previous two rounds in all categories where comparisons can be made. Because of difficulties in locating former teachers (leavers), their response rates are lower than those for current teachers (movers and stayers) (Kaufman, 1991). Response rates for public and private school teachers are not very different.

The overall response rates for the TFS are the product of the conditional response rates in table 6-5 and the overall response rates for the Teacher Survey. The overall rates for the TFS are presented in table 6-6. For teachers sampled from public schools, they range around 80 percent for the three rounds. They are lower for teachers sampled from private schools because of the appreciably lower response rates achieved for the Teacher Survey in private schools. In the first

Table 6-5.—Weighted conditional TFS response rates, by sector and teacher status: Rounds 1-3

Sector and teacher type	Weighted response rate (percent)*		
	Round 1 (1988-89)	Round 2 (1991-92)	Round 3 (1994-95)
Total	97	97	92
Current teachers	97	97	92
Former teachers	94	93	89
Public	97	97	92
Current teachers	98	97	93
Former teachers	94	92	89
Private	96	96	87
Current teachers	97	96	87
Former teachers	93	94	88
BIA	‡	‡	99
Current teachers	‡	‡	99
Former teachers	‡	‡	89

‡Not applicable.
*The basic weight is used to reflect the probability of selection.
SOURCES: Bobbitt et al. (1991); Whitener et al. (1994); Whitener et al. (1999).

Table 6-6.—Weighted overall TFS response rates, by sector and teacher status: Rounds 1-3

Sector and teacher type	Weighted response rate (percent)*		
	Round 1 (1988-89)	Round 2 (1991-92)	Round 3 (1994-95)
Public	83	84	77
Current teachers	84	84	80
Former teachers	79	80	75
Private	72	71	64
Current teachers	72	72	64
Former teachers	71	70	64

* The basic weight is used to reflect the probability of selection.
SOURCES: NCES (1992); Whitener et al. (1994, 1999).

two rounds, the overall response rates for teachers sampled from private schools are around 70 percent, but the rate falls to 64 percent in Round 3.

Item nonresponse. Table 6-7 shows unweighted item response rates, for current and former teachers, for all rounds of the TFS. The rates for the two groups of teachers and for the three rounds are not directly comparable because of some differences in questionnaire content.

Table 6-7.—Percent of items with selected response rates, by teacher status: Rounds 1-3

Teacher status	Percent of items with response rates: ≥ 90 percent	Percent of items with response rates: < 80 percent	Minimum of item response rate (percent)
Round 1 (1988-89)			
Current	90	5	65
Former	61	1	27
Round 2 (1991-92)			
Current	87	5	57
Former	95	1	67
Round 3 (1994-95)			
Current	90	4	52
Former	93	1	78

SOURCES: NCES (1992); Whitener et al. (1994, 1999).

In Round 1, a low-response item, which was common to both questionnaire versions, asked whether there were any persons, other than spouse and children, dependent on the responding teacher for more than half of their financial support. The response rate for this item was 49 percent for both current and former teachers. For current teachers, only 65 percent responded to an item that applied only to movers who had moved to a private school, asking for the religious affiliation of that school. All other items on both versions of the questionnaire had response rates of 70 percent or more.

Item response rates in Round 1 for a series of items asking for the level of respondents' satisfaction with various aspects of their current job were substantially higher for current teachers (all at about 99 percent) than they were for former teachers (83 to 91 percent) (Choy, Medrich, Henke, and Bobbitt, 1992, p. 154). Some former teachers, of course, did not have jobs for which these items would have been relevant, and the questionnaire had a skip instruction designed to allow them to bypass the items. The lower item response rates for former teachers may have been associated with some confusion about whether to skip and which set of items to skip.

Three items on the questionnaire for current teachers in Round 2 had response rates less than 80 percent. All of them related to earnings from nonteaching jobs. For former teachers, there was only one item, asking for the kind of business or industry where the respondent worked, with a response rate below 80 percent.

Only one item on the former teacher questionnaire in Round 3 had a response rate of less than 80 percent. This was the question: "In how many years do you plan to retire?" Several items had

response rates of less than 80 percent for the current teacher questionnaire. They included topics that had items with low response rates in previous rounds such as summer earnings in a nonteaching job and persons dependent on the teacher for more than half their financial support (Whitener et al., 1999). Such results suggest the need for additional questionnaire research on these topics.

6.9 ESTIMATION

Imputation. There was no imputation of missing items for Round 1. Missing values were left blank and hence treated as zeros. As a result, estimates of totals are generally underestimated. However, the imputations were later done and included on the CD-ROM (NCES, 1998) containing data from all three rounds.

There were two stages of imputation performed in Round 2: logical imputation followed by hot deck imputation. In addition, a proration imputation procedure was applied to the current teacher questionnaires to adjust components of earned income so that they added to the total earned income. Logical imputation involved assigning values for missing responses that could be deduced from the teacher's other responses to the TFS and to the Teacher Survey. Logical imputation was used for about 26 percent of the imputed values for current teachers and about 4 percent for former teachers. Proration imputation was used for 13 percent of the imputed values for current teachers.

The second stage of imputation assigned values for the remaining missing responses by hot deck imputation. For items that were also included on the Teacher Survey, the hot deck procedure took account of the Teacher Survey response in order to yield more valid estimates of change between the two surveys. Donor values were assigned within imputation classes formed in terms of such variables as full-time/part-time status, instructional level for teachers, and then they were adjusted based on the recipient's and donor's values for the same item in the Teacher Survey. When the item was not also in the Teacher Survey, the same procedure was used but without the adjustment. Flags were assigned to identify imputed values and to distinguish between those imputed by hot deck methods and others.

The imputation procedures employed in Round 3 were the same as those used in Round 2, except that an additional stage of clerical imputation was included. Clerical imputations were used when no suitable donor record was found, when the computer imputation produced an out of range entry, or when there were very few cases where an item was unanswered. The imputation flags distinguished between values that were not imputed, those imputed by ratio adjustment, those imputed by using other data on the record or from the individual's values in the Teacher Survey data file, those imputed by hot deck methods, and those imputed by clerical imputation.

Weighting. The overall weights for teachers in Round 1 of the TFS were the product of the following three components:

- *Teacher Survey final weight*: the weight assigned to the teacher in producing the estimates for that survey (for a full description, see section 5.7.3);

- *TFS basic weight*: the inverse of the teacher's probability of selection, given that he or she had been selected for the Teacher Survey;

- *Nonresponse adjustment factor*: an adjustment for eligible sample teachers for whom questionnaires were not obtained in the TFS. Within each of the 24 strata used in selecting the sample for the TFS, the nonresponse adjustments were calculated separately for each of 12 adjustment cells defined by sex, level of education (2 categories) and age (3 categories) (Waite, 1990).

The weights provided in the public-use data tape from Round 1 of the TFS were slightly different from those used to produce tabulations published in *Characteristics of Stayers, Movers, and Leavers: Results from the TFS, 1988-89* (Bobbitt et al., 1991). The resulting changes in the estimates were very small relative to their standard errors; most of the published percents were not affected (Faupel, Bobbitt, and Friedrichs, 1992, pp. 17-18).

In all rounds, a ratio adjustment was done that forces the weighted sample counts from the TFS to conform to the weighted number of teachers from SASS. Round 2 also had a SASS teacher within-school noninterview adjustment which accounted for teachers who were eligible for interview but did not participate in the 1990-91 Teacher Survey. Round 3 also had another weighting factor that was used to adjust for the fact that preliminary SASS final weights were used in computing the TFS basic weight. This factor adjusts for any changes that might have occurred between the preliminary and final weighting calculations.

Variance estimation. As with other SASS surveys, a balanced half-sample variance estimation procedure was used to estimate sampling errors for the TFS in Rounds 1 and 2 and a bootstrap procedure was used in Round 3. Since the TFS sample is a subsample of the Teacher Survey sample, at each round the same set of replicates was used for both surveys, with a weight adjustment to compensate for the subsampling (see section 5.7 on variance estimation for the Teacher Survey and Whitener, Gruber, Rohr, and Fondelier, 1998, on variance estimation for the TFS).

Tables 6-8 and 6-9 provide examples of the results of variance estimates computed by the bootstrap procedure for Round 3 expressed in terms of coefficients of variation (CVs), where the CV is the standard error of the estimate divided by the estimate. Table 6-8 presents Round 3 estimates of the percents of stayers (teachers who are teaching in the same school as they were in the base year), movers (teachers teaching in a different school), and leavers (those who have left the teaching profession) for different categories of public school, together with the CVs for those estimates. Table 6-9 presents the corresponding information for base year teachers in private schools.

With around 36 percent of the TFS sample from public schools staying at the same school across all the categories of school in table 6-8, the CVs for the estimated percents of stayers are small, with nearly all being less than 2 percent. With only small percents of movers and leavers, the CVs for these estimates are much larger, and many exceed 10 percent. The percents of stayers and movers are slightly lower for teachers at private schools than for those at public schools and the percent of leavers is much larger (around 12 percent). In general, the CVs for the estimates from the TFS private school sample are larger than those for the estimates from the public school

Table 6-8.—Coefficients of variation (CVs) for estimates of public school teachers classified as stayers, movers, and leavers, by selected school characteristics: Round 3

Base year's school characteristics	Public school teachers					
	Stayers		Movers		Leavers	
	Percent	CV (percent)	Percent	CV (percent)	Percent	CV (percent)
Total	86.3	0.6	7.2	4.5	6.6	5.2
School level						
Elementary	85.4	0.9	7.8	6.4	6.8	7.8
Secondary	87.5	0.8	5.7	8.1	6.7	7.9
Combined	87.8	2.1	7.0	20.3	5.2	20.0
Not reported*	87.4	1.8	8.0	18.3	4.6	15.4
School size						
Less than 150	78.6	4.4	10.3	19.7	11.1	32.4
150-299	85.8	1.4	7.0	12.0	7.1	12.8
300-499	86.2	1.2	7.3	10.4	6.5	11.4
500-749	85.3	1.2	7.1	10.4	7.6	8.8
750 or more	87.7	1.0	6.6	9.7	5.7	10.0
Not reported*	87.4	1.8	8.0	18.3	4.6	15.4
Minority status						
Less than 5%	87.1	1.2	4.9	11.0	8.0	11.6
5 to 19%	87.3	1.2	6.7	9.6	6.0	11.8
20 to 49%	86.6	1.1	7.2	10.1	6.2	13.2
50% or more	83.6	1.4	9.6	9.0	6.8	10.6
Not reported*	87.4	1.8	8.0	18.3	4.6	15.4
Community type						
Central city	86.1	1.3	7.6	10.3	6.3	10.2
Urban fringe/large town	86.3	1.1	7.2	8.9	6.5	10.8
Rural/small town	86.4	0.8	6.8	6.0	6.8	8.8
Region						
Northeast	88.7	1.5	5.1	13.5	6.2	14.2
Midwest	85.3	1.1	6.5	10.2	8.2	9.0
South	85.1	0.9	8.4	6.5	6.5	7.6
West	87.3	1.2	7.9	10.0	4.8	14.3

* Not reported data in this table are due to total survey nonresponse from some schools in Round 1 or Round 2 of SASS.
SOURCE: CVs are computed using estimates and standard errors from Whitener et al. (1997).

Table 6-9.—Coefficients of variation (CVs) for estimates of private school teachers classified as stayers, movers, and leavers, by selected school characteristics: Round 3

Base year's school characteristics	Private school teachers					
	Stayers		Movers		Leavers	
	Percent	CV (percent)	Percent	CV (percent)	Percent	CV (percent)
Total	82.3	1.0	5.8	6.0	11.9	5.9
School level						
Elementary	83.7	1.3	5.8	8.6	10.5	9.1
Secondary	83.0	2.1	5.5	15.1	11.5	13.1
Combined	79.1	2.8	6.0	15.0	14.9	12.3
Not reported*	82.8	3.7	5.5	23.0	11.6	24.1
School size						
Less than 150	76.0	2.6	7.9	13.3	16.2	10.5
150-299	79.6	2.4	8.0	14.1	12.4	12.0
300-499	84.3	1.8	3.2	20.0	12.5	11.7
500-749	89.6	1.7	3.3	24.3	7.1	17.9
750 or more	89.6	2.0	4.2	29.0	6.2	19.0
Not reported*	82.8	3.7	5.5	23.0	11.6	24.1
Minority status						
Less than 5%	83.9	1.5	5.1	13.5	11.0	9.6
5 to 19%	84.8	1.5	4.2	12.6	11.1	9.6
20 to 49%	77.0	3.4	7.4	17.4	15.6	14.6
50% or more	75.8	3.4	10.9	14.0	13.2	16.3
Not reported*	82.8	3.7	5.5	23.0	11.6	24.1
Community type						
Central city	83.4	1.1	5.7	8.6	10.9	6.9
Urban fringe/large town	81.9	1.9	5.5	14.4	12.6	10.5
Rural/small town	80.0	2.3	6.4	16.9	13.6	10.7
Region						
Northeast	84.0	1.8	7.1	12.8	8.9	14.7
Midwest	84.3	1.8	5.9	9.5	9.8	12.2
South	81.5	2.0	4.1	11.7	14.5	10.9
West	78.3	3.0	6.7	23.9	15.0	12.0

* Not reported data in this table are due to total survey nonresponse from some schools in Round 1 or Round 2 of SASS.

SOURCE: CVs are computed using estimates and standard errors from Whitener et al. (1997).

sample. Nevertheless, the CVs for the estimates of stayers in private schools are all less than 4 percent. However, the CVs for the estimates of movers and stayers from many categories of private school are large.

7. THE LIBRARY SURVEY

7.1 INTRODUCTION

The 1993-94 Round (Round 3) of the Schools and Staffing Surveys (SASS) added two new surveys that expanded the survey's analytic potential to address policy needs. One of these surveys is the Student Records Survey that collects data for a sample of students in SASS schools. That survey is described in chapter 8. The other survey is the Library Survey, which is, in effect, two surveys, with separate data collections for school library media centers and school library media specialists/librarians (generally abbreviated subsequently to libraries and librarians). Since these two surveys use the same methodology and are conducted in the same sample of schools, they are described together in this chapter. They are, henceforth, referred to as the Library Survey and the Librarian Survey. The Library Survey has been repeated in Round 4, but the Librarian Survey has not.

Over the past 10 years, school libraries have become a topic of interest and concern to education policymakers and researchers (Ingersoll, 1995). Round 2 of SASS obtained limited basic information about the availability, staffing, and role of libraries in the School Survey. However, it could not address issues such as the background, training, and attitudes of school librarians, and the expenditures, materials, equipment, and services provided by school libraries. Round 3 of SASS followed this initial effort by including the Library and Librarian Surveys to collect information on these topics. Data from these surveys provide the most comprehensive and extensive database on school libraries since the NCES 1985 Survey of Public and Private School Libraries and Media Centers.

The purpose of the Library Survey was to provide a national picture of school library media centers and to assess the adequacy of these centers in meeting the needs of students and staff. The goal of the Librarian Survey was to obtain data that would describe school librarians in terms of their educational background, work experience, and demographic characteristics, as well as their duties, salary, workload, and attitudes about their current position and their profession. Comparisons between librarians and teachers can be made since many questions asked in the Librarian Survey and the Teacher Survey were similar. Both surveys covered public, private, and Bureau of Indian Affairs (BIA) schools and were designed to produce estimates at the state level for public schools and at the major affiliation level (Catholic, other religious, nonsectarian) for private schools.

This chapter is organized in the same manner as the previous chapters—that is, with a section for each major survey activity: sampling frames (7.2), sample design (7.3), content (7.4), data collection procedures (7.5), data processing (7.6), measurement error (7.7), nonresponse (7.8), and estimation (7.9), and evaluation of estimates (7.10).

7.2 SAMPLING FRAMES

The target population for the Library Survey consisted of the library media centers in all the schools eligible for the School Survey (see section 2.1), except that library media centers in private schools with special program emphasis, or with special education, vocational or

alternative curricula were excluded, because it was felt that the libraries in these schools would be quite different from those in regular schools. For the purposes of the Library Survey, a library media center was defined as:

> "an organized collection of printed and/or audiovisual and/or computer resources which (a) is administered as a unit, (b) is located in a designated place or places, (c) makes resources and services available to students, teachers, and administrators. It is this definition, not the name, that is important; it could be called a library, media center, resource center, information center, instructional materials center, learning resource center, or some other name." (Gruber, Rohr, and Fondelier, 1996, *1993-94 SASS Data File User's Manual*, page F-213).

In the rest of the chapter, the term "library" will be used to mean "library media center."

The target population for the Librarian Survey comprised the school employees who were responsible for the schools' library media centers, that is, the library media specialists or librarians. Henceforth, such persons will be termed the school librarians.

7.3 SAMPLE DESIGN

The Library and Librarian Surveys were conducted in the same sample of schools. This sample was selected from the schools sampled for the School Survey. The sample comprised a subsample of public and private schools (excluding private schools with special program emphasis or with special education, vocational or alternative curricula), and all BIA schools in the School Survey. The overall sample size was 7,670 schools. The school sample sizes by sector and school level are displayed in table 7-1. These school sample sizes exceed the numbers of libraries sampled because not all sampled schools had libraries. Both for this reason and because not all school libraries had librarians, the school sample sizes also exceed the number of librarians sampled. Of the schools sampled for the Library and Librarian Surveys, 371 public schools, 465 private schools, and 18 BIA schools were out of scope or did not have libraries; 851 public schools, 1,178 private schools, and 49 BIA schools did not have librarians either because they were out of scope, because they did not have a library, because their library did not have a librarian, or because the librarian's main assignment at the school was some other position.

Table 7-1.—Sample schools selected for the Library and Librarian Surveys, by type of school: Round 3

School type	Elementary	Combined	Secondary	Total
Total	3,773	1,400	2,537	7,670
BIA	122	29	25	176
Non-BIA				
Public	2,274	698	2,022	4,994
Private	1,337	673	490	2,500

SOURCE: Gruber et al. (1996).

The basic sample design for selecting the schools for the Library and Librarian Surveys was the same for public and private schools. In each case, it was a stratified systematic sample from an ordered list with schools being selected with unequal probabilities. Public schools were stratified by state and grade level, and ordered within strata by local education agency (LEA) metro status, 1991-92 LEA Common Core Data Identification (CCD ID), school enrollment, and the 1991-92 School CCD ID. Private schools were stratified by recoded affiliation (Catholic, other religious, nonsectarian), grade level, and urbanicity and ordered within strata by frame (list or area) and school enrollment. For both public and private schools, the measure of size used for the unequal selection probability was the school's measure of size used for selection into the School Survey divided by the school's selection probability for that survey. The use of this measure of size for subsampling schools tends to cancel out the differential selection probabilities across the strata in the School Survey. Any school with a measure of size larger than the sampling interval used in its stratum was selected with certainty.

7.4 CONTENT

Libraries. The Library Survey questionnaire had five sections or content areas:

- Library media center staffing: counts of certified library media specialists, professional staff members who were not certified as library media specialists, and other paid library staff by full-time/part-time status; college degrees held by professional staff members; number of adult and student volunteers in the library; and, for private schools, counts of staff members who worked on a contributed basis.

- 1992-93 collection and expenditures: books, subscriptions, audio-visual materials, computer software, and CD-ROM titles, acquired during, and held at the end of, the school year; expenditures by type; and adequacy of the collection for the school's needs.

- Technology: technical equipment and services available in the school (library or elsewhere), (e.g., computer with modem, CD-ROMs, Internet connections, cable television, prerecorded videotapes).

- Library media center facilities: library seating capacity and other types of space in the library, such as conference rooms and workrooms.

- Scheduling and transactions: classes scheduled in the library media center; students'' use of the library media center; and the extent to which materials can be checked out by students.

Librarians. The Librarian Survey questionnaire covered the following topics:

- Current status, including whether the librarian was full time or part time, whether the librarian was also a classroom teacher, other assignments in the school, and the librarian's main activity outside the school.

- Experience and training.

- Collaborative activities, such as working with classroom teachers, and other duties at school.

- Perceptions and attitudes toward work.
- Salary, other earned income, benefits, and family income.
- Demographic information, gender, race/ethnicity, year of birth, marital status, and dependents.

There were different library questionnaires and also different librarian questionnaires for public schools, private schools, and BIA schools.

7.5 DATA COLLECTION PROCEDURES

Field test. A field test of the Library and Librarian Surveys was conducted during Round 2 of SASS. The library and librarian questionnaires were mailed to a subset of the SASS sample schools. Nonresponse followup was conducted by U.S. Census Bureau field representatives who conducted the interviews by telephone. Almost 300 questionnaires were mailed to libraries and to librarians in public schools, and almost 400 were mailed to libraries and to librarians in private schools. Over 95 percent of eligible libraries and librarians responded from public schools. The response rates for private schools were lower, at about 89 percent for eligible libraries and 86 percent for eligible librarians. A notable finding was that 53 percent of sampled private schools did not have an eligible librarian. This percent includes cases where the school was out of scope, the school did not have a library, and the library did not have a librarian. Some items with low response rates in the field test were dropped from the main survey questionnaires, while others were reworded as a result of the field test results (Williams, 1992; Gruber et al., 1996).

Procedures. The library and librarian questionnaires were mailed to sampled schools in October 1993. The library questionnaire was addressed to the "Principal," but the respondent could be the librarian or another staff member familiar with the library. The librarian questionnaire was addressed to the "Library Media Specialist/Librarian" and was to be completed by the school employee who was responsible for the school's library. As for all other SASS surveys in Round 3, reminder postcards were mailed out about 1 week after the initial mailing.

The second mailing of questionnaires was sent out in November/December to those who had not returned the completed questionnaires by that time. In this mailing, library questionnaires were sent to 56 percent of public schools sampled, 67 percent of private schools sampled, and 59 percent of BIA schools sampled. Slightly lower percents of librarian questionnaires had to be resent: to 51 percent of public school librarians, to 64 percent of private school librarians, and to 56 percent of BIA school librarians.

Computer-assisted telephone interviewing (CATI) followup of mail questionnaire nonrespondents began about 6 weeks after the second mailing of questionnaires. It was conducted between January and June 1994 from two centralized locations. Table 7-2 shows the numbers and percents of libraries and librarians requiring CATI followup and the number of successes, as well as the cases that could not be completed with CATI. As shown, about one-third of libraries and librarians had to be followed up by CATI, and success was generally good, except in the case of private school librarians, who had a much lower percent of CATI completions than the other groups. Some cases that could not be completed in CATI were

interviewed by telephone by local U.S. Census Bureau field representatives. These field representatives also had generally high success rates, except again with private school librarians.

Table 7-2.—Libraries and librarians selected for and completing telephone interview followup, by followup interview and type of school: Round 3

	CATI followup				Non-CATI followup			
	Total		Completed		Total		Completed	
School type	Number	Percent[1]	Number	Percent[2]	Number	Percent[3]	Number	Percent[4]
Libraries								
Public	1,940	39	1,143	59	385	8	365	95
Private	1,098	43	604	55	159	6	125	79
BIA	57	36	43	75	9	6	8	89
Librarians								
Public	1,382	28	990	72	342	7	274	80
Private	1,004	40	354	35	186	7	80	43
BIA	51	32	29	57	8	5	7	88

[1]Percent of sample cases in CATI followup.
[2]Percent of sample cases in CATI followup that were completed. Cases identified as noninterview and out of scope for the survey during the CATI followup are not included.
[3]Percent of sample cases in telephone followup by field representatives.
[4]Percent of sample cases in telephone followup by field representatives that were completed. Cases identified as noninterviews and out of scope for the survey during followup are not included.
NOTE: Numbers do not total because of noninterview out-of-scope cases and because nonresponse cases may be switched between CATI and non-CATI followup.
SOURCE: Gruber et al. (1996).

7.6 DATA PROCESSING

The Library and Librarian Surveys underwent the usual SASS data processing, consisting of the assignment of an initial interview status code, a clerical edit, being grouped for keying, 100 percent verification with all errors corrected, and a computer edit, before the assignment of the final interview status recode values. Computer pre-edits were not performed for either survey.

Libraries. For all three types of library questionnaire (public, private, and BIA), more than 50 percent of the variables (items requiring a response) that were edited had change rates of at least 10 percent. For example, an item with 433 or more changes (corrections or deletions) among the 4,321 public library records computer edited would have a change rate of 10 percent or more. Additionally, for all three types of questionnaires, at least 10 percent of the variables had change rates of 50 percent or more, implying that many respondents had problems with these variables. Three questions with the same format asked for the numbers of state-certified library media specialists, noncertified professional staff members, and other paid workers according to the fraction of time they worked in the library (categorized in quarters, e.g., at least one-half time but less than three fourths time). The responses to all categories of these questions, except the

"None" response, were subject to very high rates of change. Fondelier (1996) recommended that the question wording needed to include the word "library" when asking about the types of staff working in the library, as teachers were often reported. Another example of a question with a very high change rate was a "mark all that apply" question that asked about the types of available space in the library. All but two of the 10 categories listed in this question had high change rates; the two that did not were the "None" category and the "Individual reading, viewing, and listening" category.

Librarians. The rate of edit changes was smaller for the librarian questionnaires than for the library questionnaires. For all three types of school librarians, about 30 percent of the edited variables had change rates of 10 percent or more, and 5 percent or less had change rates greater than 50 percent. One "mark all that apply" question asked the librarian about the school levels—prekindergarten, elementary (including kindergarten), middle school or junior high, senior high, and postsecondary—at which he or she had worked for a year or more. The responses to the three middle levels had high change rates across all three sectors.

7.7 MEASUREMENT ERROR

Some reinterviews were conducted for a subset of questions from the library questionnaires, but none were done for the librarian questionnaires. The data collection method for the library reinterviews was matched to that used in the original data collection; the reinterviews were by mail questionnaire for schools that responded to the original questionnaire by mail and by CATI interview from a centralized location for those that were originally interviewed by CATI. For the telephone reinterviews, the interviewers attempted to reinterview the respondent who completed the original questionnaire.

A systematic subsample of 1,780 schools (833 public schools and 947 private schools) was selected from the original sample for reinterview. Reinterview samples were selected before the mailout of survey questionnaires, so the sample includes losses due to original survey noninterviews (Gruber et al., 1996). Out of the targeted number, only 1,343 were eligible (i.e., the school was not out of scope and had a library), and of these, 959 reinterviews were obtained for a response rate of about 72 percent. The subset of questions in the reinterview questionnaire comprised 32 items, many of which had multiple response categories. These items collected information on library staffing, 1992-93 collection and expenditures, technology, library media center facilities, and scheduling and transactions.

Salvucci et al., (1997) provides a summary of the library reinterview results by the five sections of the questionnaire described above. The results are expressed in terms of the L-fold index of inconsistency; values of the index less than 20 may be considered as low, values between 20 and 50 as moderate, and values over 50 as high (see section 2.6.3 for a description of the index). None of the five sections had low average values of the index for the items included in the reinterviews. The Technology Section had the lowest average value for the index at 23, followed by the Scheduling and Transactions Section with an average of 32, and the Collection and Expenditures Section with an average of 37. The Staffing Section had an average moderate value, and the Facilities Section had a high average value of 52.

The analyses of the reinterviews identified a number of problematic questions and led to suggestions for changes in the future. For example:

- Three questions asked for the number of professional staff of different types working in the library media center in categories according to the fraction of time spent (e.g., full time, at least three-fourths time but less than full time). These are the same items that had high edit change rates discussed above. Respondents had difficulty with the time categories and two of the items had high indexes of inconsistency (59.3 and 50.7). Improved definitions of the categories were recommended. In Round 4, the "¼ to ½ time" and the "less than ¼ time" categories were dropped as these were found to be the most problematic by the reinterviews.

- The responses to the questions on the numbers of materials of different types (e.g., books, video materials) the library acquired in the past year and held at the end of the year were observed to heap at rounded estimates. They were also subject to moderate levels of inconsistency. It appeared that respondents had difficulty giving consistent and exact numbers. Recommendations were made to simplify this task. The matrix that asks for these library holdings was revised for Round 4.

- Some definitional changes were recommended in the Technology Section. The number of microcomputers is not asked for in Round 4.

- The question on types of space available in the library media center was in a "mark all that apply" format. As noted above, this question was also subject to high edit change rates. The reinterviews showed that all the responses had moderate or high levels of inconsistency. The seven items with a high level of inconsistency had index values that ranged from 54.9 to 68.2. A recommendation was made to avoid the "mark all that apply" format in the future. A "Yes/No" response format was used for each type on space available in Round 4.

7.8 NONRESPONSE

Unit nonresponse. Weighted unit response rates for both the Library and Librarian Surveys are presented by state for public schools in table 7-3 and by affiliation group for private schools in table 7-4. Throughout the rates are computed for in-scope schools, excluding schools without libraries and special education libraries in private schools for the Library Survey, and also libraries without librarians for the Librarian Survey.

The overall weighted response rate for the Library Survey was about 86 percent, with the rate of 90 percent for public schools being much higher than the rate of 71 percent for private schools. Fondelier (1996) suggested that the relatively low response rate for private schools reflected response burden, in that the same schools were selected to respond to the School Survey and were asked to provide a substantial amount of detailed information. Further, some small schools with small libraries may have believed that the survey did not apply to them because of the many technology questions. This lower response rate for libraries of private schools should be noted when doing analysis. By state, the rates for public school libraries varied between 80 percent for Nebraska and Louisiana and 98 percent for Alabama and Florida, except for Alaska that had a

Table 7-3.—Weighted response rates for the public school Library Survey and the Librarian Survey, by state: Round 3

State	Weighted response rate (percent)*		State	Weighted response rate (percent)*	
	Library Survey	Librarian Survey		Library Survey	Librarian Survey
Total	90	92			
Alabama	98	96	Montana	86	90
Alaska	74	81	Nebraska	80	85
Arizona	97	95	Nevada	90	90
Arkansas	97	92	New Hampshire	96	98
California	82	88	New Jersey	83	95
Colorado	89	87	New Mexico	90	94
Connecticut	87	96	New York	85	92
Delaware	90	94	North Carolina	91	96
District of Columbia	85	86	North Dakota	83	88
Florida	98	94	Ohio	89	86
Georgia	96	94	Oklahoma	90	94
Hawaii	97	96	Oregon	95	94
Idaho	95	95	Pennsylvania	92	99
Illinois	89	91	Rhode Island	92	95
Indiana	97	97	South Carolina	92	98
Iowa	97	96	South Dakota	81	91
Kansas	95	96	Tennessee	91	86
Kentucky	85	90	Texas	95	87
Louisiana	80	98	Utah	95	96
Maine	90	91	Vermont	92	96
Maryland	90	95	Virginia	92	91
Massachusetts	88	89	Washington	96	97
Michigan	91	91	West Virginia	85	94
Minnesota	92	97	Wisconsin	92	96
Mississippi	91	91	Wyoming	87	95
Missouri	93	96			

*The basic weight is used to reflect the probability of selection.
SOURCE: Gruber et al. (1996).

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Table 7-4.—Weighted response rates for the private school Library Survey and the Librarian Surveys, by affiliation group: Round 3

Affiliation group	Weighted response rate (percent)*	
	Library Survey	Librarian Survey
All private schools	71	77
Catholic	82	86
Parochial	80	85
Diocesan	86	85
Private Order	84	92
Other Religious	59	58
Conservative Christian	58	71
Affiliated	66	66
Unaffiliated	53	34
Nonsectarian	70	88
Regular	75	90
Special emphasis	56	79
Special education	‡	‡

*The basic weight is used to reflect the probability of sample selection.
‡Not applicable. (Data were not collected from special education libraries; those libraries were out of scope.)
SOURCE: Gruber et al. (1996).

rate of only 74 percent. Among private schools, the rate for Catholic school libraries (82 percent) was much higher than that for other religious school libraries (59 percent) and nonsectarian school libraries (70 percent).

The higher response rate for public schools than for private schools observed in the Library Survey is also found in the Librarian Survey: the weighted response rate of 92 percent for public school librarians is appreciably higher than the 77 percent for private school librarians. Again, this lower response rate for librarians in private schools should be noted. For public schools, the rate varies by state from a low of 81 percent in Alaska to almost complete response in Pennsylvania. For private schools, the response rate is only 58 percent for librarians in other religious schools, as compared with 86 percent for those in Catholic schools and 88 percent for those in nonsectarian schools. The response rates for BIA schools were 89 percent for the Library Survey and 88 percent for the Librarian Survey.

As with other SASS surveys, Monaco et al. (1998) conducted analyses to examine variation in response rates in the Library and Librarian Surveys by school characteristics. Some results are presented for both surveys in table 7-5, including the significance levels reached using an overall

Table 7-5.—Weighted response rates for Library and Librarian Surveys, by selected characteristics: Round 3

Characteristics	Library Survey Weighted response rate (percent)*		Librarian Survey Weighted response rate (percent)*	
	Public	Private	Public	Private
Region:				
West	88	69	91	78
South	92	71	92	77
Northeast	88	63	94	68
Midwest	91	78	93	83
	P=0.058	P<0.001	P=0.263	P=0.004
Urbanicity:				
Central city	88	74	90	81
Urban fringe/large town	88	70	92	74
Rural	92	66	94	72
	P=0.026	P=0.053	P=0.036	P=0.061
School level:				
Combined	76	61	90	67
Secondary	92	86	94	91
Elementary	90	72	92	76
	P<0.001	P<0.001	P=0.011	P<0.001
School size:				
1-149	80	52	91	44
150-499	90	81	92	84
500-749	93	87	91	93
750+	92	92	95	91
	P<0.001	P<0.001	P=0.172	P<0.001
School type:				
Nonregular	53	‡	86	‡
Regular	91	‡	92	‡
	P<0.001		P=0.103	
Minority enrollment:				
<5.5%	91	‡	93	‡
5.5-20.5%	92	‡	94	‡
20.5-50.5%	90	‡	92	‡
>50.5%	86	‡	88	‡
	P=0.019		P=0.008	
School sampled in 1990-91:				
Yes	89	81	91	84
No	91	68	93	74
	P=0.351	P<0.001	P=0.463	P=0.001
1991-92 PSS status:				
Respondent	‡	72	‡	79
Nonrespondent	‡	39	‡	32
Not in 1991-92 PSS	‡	51	‡	45
		P<0.001		P<0.001

*The basic weight is used to reflect the probability of sample selection.
‡Not applicable.
SOURCE: Monaco et al. (1998).

test (Rao-Scott chi-squared statistic) for differences in rates across the categories of the variable concerned. The results are generally comparable across surveys. The public and private schools in both the Library and Librarian Surveys show significant differences by category for school level, with highest response rates for secondary schools throughout. Except for public schools in the Librarian Survey, school size is significantly associated with survey response, with the smallest schools having lower response rates. There are significant regional differences in response rates for private but not public schools in both surveys, with lower rates in the Northeast. Minority enrollment and urbanicity are significantly associated with response for public schools in both surveys. The association of urbanicity and response is almost significant at the 5 percent level for private schools in both surveys, but the direction of the association is the opposite of that for public schools: rural schools had the highest rates for public schools but the lowest rates for private schools. The response rate for librarians in private schools that were nonrespondents in the 1991-92 Private School Survey is extremely low for both the Library Survey (39 percent) and the Librarian Survey (31 percent).

Further analyses conducted by Monaco et al. (1998) showed significant associations between response status in the Library Survey and response status in the Librarian Survey for both public and private schools. Also the response status for both these surveys was significantly associated with the school's response status in the School Survey and in the Principal Survey. For public schools, there was also a significant association of response status for both surveys with the response status of the school's LEA in the Teacher Demand and Shortage Survey (TDSS).

Item nonresponse. Table 7-6 provides some summary information about unweighted item response rates for the two surveys. Although there were few missing data for most items in both surveys, the summary information in the table indicates that there were some problematic items.

Table 7-6.—Percent of items with selected response rates in the Library and Librarian Surveys, by sector: Round 3

Sector	Percent of items with response rates: ≥ 90 percent	Percent of items with response rates: < 75 percent	Minimum of item response rate (percent)
Libraries			
Public	81	5	57
Private	80	4	66
BIA	82	1	61
Librarians			
Public	87	6	61
Private	80	11	50
BIA	87	5	56

SOURCE: Gruber et al. (1996).

The item in the Library Survey that had the lowest item response rate for all three sectors (around 60 percent) asked for the number of students using the library in the most recent full week of school. Fondelier (1996) suggested that this item should be deleted from future data collections because of the low response rate. Other items with low response rates were the elements of a grid in which the respondent was asked to record acquisitions, holdings, and expenditures for a set of materials (e.g., books, microcomputer software) for the past school year. The response rates for most of these items were less than 75 percent. As noted above, the reinterview program showed that when this information was provided, it had a moderate level of inconsistency.

The set of items with the lowest response rates in the Librarian Survey were items asking the librarian to report the frequency (weekly, monthly, annually or never) with which they worked with the school's classroom teachers to plan units of instruction in different subject areas. The later subjects in the list (arts and humanities, health/physical education, vocational/technical education, guidance, and English/language arts) had particularly low response rates, averaging around 63 percent for public school librarians, 54 percent for private school librarians, and 58 percent for BIA school librarians. This question is asked in Round 4 with a different matrix format.

Another item with a particularly low response rate appeared only on the questionnaire for private school librarians. It asked whether or not the librarian worked in the school on a contributed service basis for less than full salary or no salary; only 65 percent of librarians responded. Both for public and private school librarians, items asking about the major field and year earned for education specialist or professional diplomas and for doctorates had response rates of less than 75 percent.

7.9 ESTIMATION

Imputation. The same three stages of imputation were used for the Library and Librarian Surveys. At the first stage, items were completed wherever possible by using information from other questionnaire items on the data record, from the matching library or librarian questionnaire or, for libraries, from the matching SASS school questionnaire. At the second stage, a hot deck imputation method was used to fill in missing data by using data from a similar library or librarian record. For some items, the values were simply taken from the donor record but, in other cases, the donor's value was used as a factor along with other information on the incomplete record to assign a value for a missing response. Different sorting variables were used for public, private and BIA school libraries and librarians for matching recipients and donors. In a few cases, when the number of missing values was small or when no suitable donor could be found, the missing values were completed by clerical imputation. Imputation flags were employed to denote the stage of imputation as for other SASS surveys.

Weights. The weighting procedures for the Library and Librarian Surveys were of the same general form. In each survey, the weights were computed separately for public, private and BIA schools. The final weights are the product of the following factors:

- School basic weight: the inverse of the probability of selection for the School Survey.

- Library subsampling factor: an adjustment that accounts for the subsampling of schools from the School Survey sample for the Library and Librarian Surveys.

- Sampling adjustment factor: an adjustment that accounts for unusual circumstances that affect the school's probability of selection for the School Survey (such as splits, mergers, or duplication).

- Type A noninterview adjustment factor: an adjustment that accounts for library nonrespondents where it is not known whether or not the school had a library and where, for the Librarian Survey, it accounts for library nonrespondents that did not report whether or not they had a library and the librarian was a refusal or unable to contact.

- Type B noninterview adjustment: an adjustment that accounts for library nonresponse (for the Library Survey) or librarian nonresponse (for the Librarian Survey), when the school is known to have a library.

- Type C noninterview adjustment factor (for the Librarian Survey only): an adjustment that accounts for librarian nonresponse when librarian status is known.

- First-stage ratio adjustment factor: a factor that adjusts sample estimates for the total number of noncertainty schools in the Library and Librarian Surveys to corresponding frame totals.

- Second-stage ratio adjustment factor: In the case of the Library (Librarian) Survey this factor is applied using information about the presence of a library (librarian) only from the School Survey (information that may differ from that reported in the Library and Librarian Surveys). The adjustment is the ratio of the weighted count of schools with libraries (librarians) from the School Survey to the weighted count of schools with libraries (librarians) in the Library (Librarian) Survey sample. A corresponding adjustment is made for schools without libraries (librarians).

The weighting adjustments outlined above were performed within adjustment cells, with collapsing of cells when the adjustments were too large or the cell sample sizes were too small. For example, for public schools, the Type A and Type B adjustment factors were applied within cells defined by state by grade level by enrollment by urbanicity, and cells were collapsed if the adjustment factor exceeded 1.5 or the number of schools was less than 10. Details of the various adjustment cells are provided by Gruber et al. (1996, pp. 296-300).

Variance estimation. As with most other Round 3 SASS surveys, a bootstrap method of variance estimation is used for the Library and Librarian Surveys (see section 2.7.5). The bootstrap replicate weights are the corresponding weights in the School Survey sample adjusted for the subsampling. However in two situations the balanced half-sample replication is used in place of the bootstrap: these are cases of schools selected with certainty for the School Survey, but subsampled for the Library and Librarian Surveys, and private schools sampled from the area frame for the School Survey (Abramson et al., 1996).

Tables 7-7 and 7-8 present estimates from the Library Survey of the percent of schools with libraries that have a computer and modem, the percent rating the current support in science and

Table 7-7.—Coefficients of variation (CVs) for selected items from the public school Library Survey, by selected school characteristics: Round 3

School characteristic	With a computer and modem		Rating current support in science/technology as excellent or adequate		State-certified library media specialist	
	Percent	CV (percent)	Percent	CV (percent)	Number	CV (percent)
School level						
Elementary	28.3	4.2	54.2	2.6	41,911	2.2
Secondary	48.2	3.1	49.3	2.6	23,287	2.3
Combined	37.9	7.9	45.0	6.7	1,484	6.0
School size						
0-149	29.5	10.8	50.2	6.0	4,411	8.6
150-299	25.8	8.5	47.4	5.9	9,564	5.7
300-599	31.4	4.5	50.8	3.8	25,137	3.2
600 or more	44.6	3.6	59.7	2.8	23,279	3.0
Free lunch eligibility						
Less than 20%	43.4	4.8	55.1	4.2	20,698	4.0
20-49%	33.0	4.5	54.0	3.5	20,612	3.8
50% and more	27.3	6.6	50.5	4.0	18,406	4.0

SOURCE: CVs are computed using estimates and standard errors from Chaney and Williams (1998).

Table 7-8.—Coefficients of variation (CVs) for selected items from the private school Library Survey, by selected school characteristics: Round 3

School characteristic	With a computer and modem		Rating current support in science/technology as excellent or adequate		State-certified library media specialist	
	Percent	CV (percent)	Percent	CV (percent)	Number	CV (percent)
School level						
Elementary	12.2	12.3	48.9	3.5	2,158	10.5
Secondary	30.2	6.3	41.3	7.5	1,947	8.5
Combined	27.9	9.7	31.2	8.7	1,266	6.5
School size						
0-149	14.3	15.4	34.8	8.0	956	15.2
150-299	17.3	9.8	46.5	5.2	1,363	9.0
300-599	23.4	10.3	55.2	4.5	1,574	11.6
600 or more	47.4	6.5	60.9	5.6	834	7.1
Catholic	16.0	8.1	50.6	3.4	2,662	6.0

SOURCE: CVs are computed using estimates and standard errors from Chaney and Williams (1998).

technology as excellent or adequate, and the total number of state-certified library media specialists for public and private schools, respectively, classified by school characteristics. The tables also include the coefficients of variation (CVs) of these estimates computed using the bootstrap method of variance estimation. All but one of the estimates for the various categories of public school have CVs of less than 10 percent, and many of the CVs are much less than this. The CVs for the private school estimates are larger, with several exceeding 10 percent.

Tables 7-9 and 7-10 present estimates and CVs from the Librarian Survey for public and private schools, respectively, classified by the same school characteristics. The three estimates in these tables are the percent of the librarians who are regular full-time librarians, the percent who are state-certified as library media specialists, and their mean number of years since they first worked as librarians. The CVs for the majority of the estimates for public school librarians are less than 5 percent and only one exceeds 10 percent. The CVs for the estimates for private school librarians are larger, but only 3 exceed 10 percent.

7.10 EVALUATION OF ESTIMATES

Dickson and Kindel (1998) compared estimates from the Library and Librarian Surveys with each other and with counts and estimates from the SASS School Survey, the TDSS, the CCD State Nonfiscal Survey, and the National Public Education Financial Survey (NPEFS). For each comparison, the authors developed a hypothesis as to whether the counts or estimates from the Library or Librarian Surveys should be higher, lower, or about the same as the counts or estimates from these other surveys. One of two outcomes resulted for each comparison—expectations were met or they were not. Comparisons were made by school type (public, private, or BIA) at the school, state, or national levels as appropriate. State-level comparisons were not available for private schools since the survey was not designed to produce such estimates. Items for comparison included the number of libraries, the role of librarians in school decisionmaking, and numbers of various types of library staff.

Comparisons were made between the Library and Librarian Surveys at the school level for counts of state-certified librarians and for counts of professional staff members. Data were found to be consistent between these two surveys. Other results are presented first for libraries and then for librarians.

Libraries. Most comparisons involving data from the Library Survey produced results consistent with the hypothesis, such as counts at the school level and estimates at the state and national levels of the number of libraries between the Library and School Surveys; counts at the school level and estimates at the state and national levels of total staff between the Library and School Surveys; estimates at the state and national levels of the number of Library Survey librarians and other staff working in the libraries of public schools compared to the number of librarians from the TDSS; estimates at the state and national levels of the number of total library staff between the Library Survey and the CCD State Nonfiscal Survey, and estimates at the state and national levels of the number of other professional staff in libraries from the Library Survey compared to the estimated number of library and media support staff from the CCD State Nonfiscal Survey.

Table 7-9.—Coefficients of variation (CVs) for selected items from the survey of public school librarians, by selected school characteristics: Round 3

School characteristic	Regular full-time librarian at sampled school		Certified by their state as a library media specialist		Years since first worked as a librarian	
	Percent	CV (percent)	Percent	CV (percent)	Mean	CV (percent)
School level						
Elementary	62.4	2.2	79.4	1.4	11.7	2.6
Secondary	76.2	1.8	90.8	1.1	14.8	1.4
Combined	61.0	6.4	87.5	1.7	13.6	3.7
School size						
0-149	21.9	14.2	85.4	3.3	12.3	5.7
150-299	36.6	6.8	81.9	2.9	11.7	6.0
300-599	67.2	2.1	81.2	1.7	12.1	3.3
600 or more	89.8	1.5	85.0	2.0	13.8	2.2
Free lunch eligibility						
Less than 20%	67.9	2.9	87.0	1.6	13.4	2.2
20-49%	66.7	3.4	82.6	1.8	12.8	3.1
50% and more	65.3	3.7	78.4	2.6	11.7	2.6

SOURCE: CVs are computed using estimates and standard errors from Chaney and Williams (1998).

Table 7-10.—Coefficients of variation (CVs) for selected items from the survey of private school librarians, by selected school characteristics: Round 3

School characteristic	Regular full-time librarian at sampled school		Certified by their state as a library media specialist		Years since first worked as a librarian	
	Percent	CV (percent)	Percent	CV (percent)	Mean	CV (percent)
School level						
Elementary	40.8	5.6	22.2	8.1	9.2	5.4
Secondary	69.8	3.3	47.8	4.6	11.7	4.3
Combined	57.8	6.9	36.3	9.1	9.6	6.3
School size						
0-149	75.2	5.6	33.2	16.6	10.8	11.1
150-299	41.4	5.6	20.9	8.6	9.0	5.6
300-599	67.1	4.6	36.1	7.8	9.9	5.1
600 or more	86.4	2.9	58.9	20.0	12.8	5.5
Catholic	54.5	4.2	30.0	6.3	10.0	4.0

SOURCE: CVs are computed using estimates and standard errors from Chaney and Williams (1998).

A few comparisons did not produce the expected results. While the counts and estimates of the number of libraries were consistent between the Library and School Surveys, tables 7-11 and 7-12 show that the reporting between surveys for schools with no libraries was less consistent, with the estimate from the Library Survey being lower than the School Survey estimate at the national level.

Table 7-11.—Estimates of public schools with no library media center from the Library Survey and the School Survey, by state: Round 3

State	Library Survey	School Survey	Library/ School (percent)	State	Library Survey	School Survey	Library/ School (percent)
Total	2,969	3,833	77				
Alabama	0	33	0	Montana	0	16	0
Alaska	27	48	55	Nebraska	22	19	115
Arizona	43	26	166	Nevada	19	10	185
Arkansas	24	0	0	New Hampshire	17	38	44
California	365	448	81	New Jersey	169	128	131
Colorado	32	25	125	New Mexico	15	34	44
Connecticut	29	51	57	New York	142	187	76
Delaware	13	11	125	North Carolina	35	42	83
District of Columbia	8	7	117	North Dakota	54	43	124
Florida	28	70	40	Ohio	97	87	111
Hawaii	6	6	99	Oklahoma	88	69	128
Idaho	12	30	41	Oregon	8	3	233
Illinois	183	219	84	Pennsylvania	152	181	84
Indiana	43	41	104	Rhode Island	15	17	89
Iowa	27	27	100	South Carolina	16	29	55
Kansas	0	46	0	South Dakota	10	15	63
Kentucky	0	26	0	Tennessee	0	47	0
Louisiana	84	76	111	Texas	450	311	145
Maine	74	55	134	Utah	22	23	95
Massachusetts	169	212	80	Virginia	51	64	80
Michigan	33	278	12	Washington	60	101	59
Minnesota	44	49	89	West Virginia	176	128	137
Mississippi	68	61	111	Wisconsin	5	20	27
Missouri	18	50	36	Wyoming	21	15	142

SOURCE: Dickson and Kindel (1998)

Table 7-12.—Estimates of Bureau of Indian Affairs schools with no library media center from the Library Survey and the School Survey, by state: Round 3

State	Library Survey	School Survey	Library/School (percent)
Total	10	11	90
Idaho	1	1	98
Minnesota	1	1	110
New Mexico	3	3	90
South Dakota	3	4	80
Washington	1	1	98
Wisconsin	1	1	93

SOURCE: Dickson and Kindel (1998)

Although it was expected that counts and estimates of total staff would differ between the Library and School Surveys, with the counts from the Library Survey being higher because of the lack of instruction for reporting counts of staff assigned to more than one function or school for the Library Survey (instructions were present on the School Survey), there were some results contrary to this expectation when estimates for full-time and part-time staff were examined. It was found that the estimates of full-time library aides were notably lower on the Library Survey than those for the School Survey (see tables 7-13 and 7-14). A possible explanation was that in the School Survey imputation process, the TDSS information had precedence over information on the Librarian and Library Surveys during the first stage of imputation. In almost 500 imputation cases, it was found that the LEA on the TDSS had reported no librarian, but the Library Survey reported one or more librarians.

The comparison between the Library Survey estimate of state-certified librarians at the state and national levels and the CCD State Nonfiscal Survey counts of librarians and media specialists also contradicted the hypotheses. Table 7-15 shows that the Library Survey state estimates were generally higher than the CCD State Nonfiscal Survey counts. Possible reasons suggested were the different units of collection, different levels of reporting, and differences in terminology and definitions.

The study recommended the following: review of the practice of classifying libraries as out of scope when their schools are out of scope; increasing response rates; and reviewing imputation and estimation procedures, definitions and forms design.

Librarians. Most comparisons involving the Librarian Survey were consistent with the established hypotheses. These included comparisons at the state and national levels between the Librarian and School Surveys for full-time and part-time librarians; item comparisons at the school level between the Librarian and School Surveys about the role of librarians in schools regarding decisionmaking; national- and state-level estimates of the number of librarians between the public school Librarian Survey and the CCD State Nonfiscal Survey; and state- and national-level estimates of public school librarian salaries between the Librarian Survey and the NPEFS.

The only comparison that did not conform to the hypothesis was the comparison of the Librarian Survey respondent's main assignment at the school level to the number of full-time and part-time librarians from the School Survey. While there was a high level of agreement in reporting for full-time librarians for public and BIA schools, there were a notable number of cases where a full-time respondent on the Librarian Survey was reported as part time on the School Survey for private schools. For all types of schools, there were also a notable number of part-time librarians on the Library Survey reported as full time on the School Survey. Incomplete or confusing instructions for reporting part-time staff serving more than one function or school instructions for volunteers were believed to be important factors in these discrepancies.

Dickson and Kindel proposed that response rates be improved; that data be collected and tabulated for volunteers; and that the imputation and estimation procedures, definitions, and forms design be reviewed. It was also suggested that data be collected in full-time equivalents.

Table 7-13.—Estimates of full-time library aides for public schools from the Library Survey and the School Survey, by state: Round 3

State	Library Survey	School Survey	Library/ School (percent)	State	Library Survey	School Survey	Library/ School (percent)
Total	26,555	31,998	83				
Alabama	331	532	62	Montana	92	168	55
Alaska	79	77	103	Nebraska	305	415	73
Arizona	320	540	59	Nevada	70	156	45
Arkansas	122	217	56	New Hampshire	137	181	76
California	1,744	1,944	90	New Jersey	905	722	125
Colorado	568	633	90	New Mexico	217	326	67
Connecticut	476	455	105	New York	1,496	1,675	89
Delaware	17	24	73	North Carolina	538	839	64
District of Columbia	28	40	70	North Dakota	99	116	85
Florida	1,260	1,412	89	Ohio	1,187	1,354	88
Georgia	886	1,284	69	Oklahoma	605	800	76
Hawaii	56	52	108	Oregon	431	588	73
Idaho	100	274	37	Pennsylvania	845	1,021	83
Illinois	1,637	1,471	111	Rhode Island	59	25	233
Indiana	888	1,101	81	South Carolina	506	817	62
Iowa	464	647	72	South Dakota	101	162	62
Kansas	420	545	77	Tennessee	268	312	86
Kentucky	290	532	55	Texas	2,636	3,319	79
Louisiana	256	219	117	Utah	129	166	78
Maine	231	403	57	Vermont	91	122	75
Maryland	342	467	73	Virginia	793	710	112
Massachusetts	576	507	114	Washington	556	630	88
Michigan	1,166	1,100	106	West Virginia	19	41	47
Minnesota	726	705	103	Wisconsin	652	971	67
Mississippi	404	463	87	Wyoming	115	165	69
Missouri	320	555	58				

NOTES: For this table, library media center aides are defined as: For the Library Survey = library aides and clerks working in the library. For the School Survey = library aides.
SOURCE: Dickson and Kindel (1998).

Another study by Cole (1997) estimated the possible bias in average librarian salary as collected in the Librarian Survey, for both public and private schools. Only one library employee per school (presumably the head librarian) completed the Librarian Survey questionnaire, with only this respondent's income reported. Because some schools have more than one librarian and the respondent head librarian's salary would generally be higher than those of the library's other employees, it was felt that the average librarian salary estimate from the Librarian Survey was an overestimate of the average salary of all librarians in the country. The study concluded that the

Table 7-14.—Estimates of full-time library aides in Bureau of Indian Affair schools from the Library Survey and the School Survey, by state: Round 3

State	Library Survey	School Survey	Library/School (percent)
Total	44	53	83
Arizona	12	18	67
California	1	1	136
Connecticut	0	0	0
Florida	0	0	0
Idaho	0	0	0
Iowa	0	0	0
Kansas	0	0	0
Louisiana	0	0	0
Michigan	1	0	0
Minnesota	1	1	115
Mississippi	0	0	0
Montana	0	0	0
Nevada	0	0	0
New Mexico	15	14	104
North Carolina	0	2	0
North Dakota	3	4	83
Oklahoma	1	0	0
Oregon	0	0	0
South Dakota	7	10	64
Utah	0	0	0
Washington	3	2	134
Wisconsin	0	1	0
Wyoming	0	0	0

NOTES: For this table, library media center aides are defined as: For the Library Survey = library aides and clerks working in the library. For the School Survey = library aides.
SOURCE: Dickson and Kindel (1998).

original salary estimates were close to those produced in this study. The average bias was estimated at 1 percent for public school librarians and 4 percent for private school librarians. The positive average bias results mean that the original estimates were overestimates as expected. For about 80 percent of public school libraries and 70 percent of private school libraries, the bias in the original estimate of average salary was zero (includes libraries with only one employee). Of the 20 percent of public school and 30 percent of private school libraries with nonzero bias values, about 5 percent of public and 6 percent of private school libraries had bias values that indicated that the original average salary estimates overestimated the "true" average salaries by an average of 50 percent or more.

Table 7-15.—Estimates of public school librarians from the Library Survey with CCD State Nonfiscal Survey, by state: Round 3

State	Library Survey	CCD Survey	Library/ CCD (percent)	State	Library Survey	CCD Survey	Library/ CCD (percent)
Total	66,682	50,501	132				
Alabama	1,247	1,194	104	Montana	896	339	264
Alaska	253	156	162	Nebraska	973	558	174
Arizona	825	773	107	Nevada	281	239	118
Arkansas	1,101	948	116	New Hampshire	301	254	119
California	2,609	928	281	New Jersey	2,252	1,800	125
Colorado	754	704	107	New Mexico	363	243	149
Connecticut	707	654	108	New York	3,987	2,983	134
Delaware	143	116	124	North Carolina	2,203	2,151	102
District of Columbia	157	173	91	North Dakota	459	179	256
Florida	2,370	2,513	94	Ohio	2,650	1,776	149
Georgia	1,969	2,053	96	Oklahoma	1,430	860	166
Hawaii	230	286	80	Oregon	803	665	121
Idaho	321	168	191	Pennsylvania	3,121	2,170	144
Illinois	2,936	1,973	149	Rhode Island	292	82	356
Indiana	1,458	1,047	139	South Carolina	1,168	1,085	108
Iowa	1,354	652	208	South Dakota	579	208	278
Kansas	1,504	973	155	Tennessee	1,514	1,280	118
Kentucky	1,420	1,187	120	Texas	5,101	4,143	123
Louisiana	1,240	1,217	102	Utah	404	267	151
Maine	385	241	160	Vermont	284	199	143
Maryland	1,239	1,078	115	Virginia	1,783	1,945	92
Massachusetts	1,161	567	205	Washington	1,339	1,255	107
Michigan	2,022	1,500	135	West Virginia	550	360	153
Minnesota	1,430	984	145	Wisconsin	1,911	1,339	143
Mississippi	781	640	122	Wyoming	292	135	217
Missouri	2,130	1,261	169				

NOTES: The CCD state nonfiscal survey collects data in full-time equivalents, while the Library Survey collects counts. For the Library Survey, the data include those working with computer resources. For the CCD Survey, the data may include library media specialists/ librarians providing district and regional level media services.
SOURCE: Dickson and Kindel (1998).

It was recommended that in future data collections, either the salaries of all library employees be obtained, or a more accurate way be developed to account for the salaries of nonhead librarians at libraries with more than one employee.

8. THE STUDENT RECORDS SURVEY

8.1 INTRODUCTION

A Student Records Survey was added to the Schools and Staffing Surveys (SASS) for the 1993-94 Round (Round 3). The motivation for this survey was that student information, combined with information from the teacher and school samples, would provide the opportunity to explore student assignment and behavior patterns over a wide range of teachers and schools (Ingersoll, 1995). In particular, the purpose of the Student Records Survey was to collect data that could be used to examine the distribution of school programs and the quality of teachers among students of differing demographic and academic characteristics and to describe students' participation in school programs and services. A topic of particular interest was the participation of American Indian students in special programs. Data for this survey were collected from administrative records, not directly from students; such data items as sex, date of birth, race/ethnicity, country of birth, language spoken at home, grade level, participation in programs and services, grade point average (GPA), and attendance record are readily available from such records. The survey included students in public schools, private schools, and Bureau of Indian Affairs (BIA) schools, and was designed to produce estimates at the national level for students from each of these school types.

This chapter is organized in the same manner as the previous chapters—that is, with a section for each major survey activity: sampling frames (8.2), sample design (8.3), content (8.4), data collection procedures (8.5), data processing (8.6), measurement error (8.7), nonresponse (8.8), and estimation (8.9). Since no evaluation of estimates was available, the chapter contains no section on this topic.

8.2 SAMPLING FRAMES

The target population for the 1993-94 Student Records Survey consisted of all students included in grades K-12 in the fall of 1993 who were in the target population of schools for the School Survey. Furthermore, since the survey was to be linked to the Teacher Survey, the students in the target population also needed to be taught by one or more teachers in the target population for the Teacher Survey.

The sampling frame for the Student Records Survey was created in four stages corresponding to the four stages of sampling involved. At the first stage, a sample of schools was selected for the School Survey from the school sampling frames. The properties of those frames are described in sections 2.4.1 and 2.4.2. At the second stage, a subset of the schools sampled for the School Survey was selected for the Student Records Survey. At the third stage, a sample of teachers was selected in this subset of schools from teachers selected for the Teacher Survey. At the fourth stage, a sample of students of selected teachers was selected from class rosters. Some problems that were encountered with the class rosters are described below.

8.3 SAMPLE DESIGN

The first stage of sampling for the Student Records Survey was the selection of the schools for the School Survey, as described in section 2.4. The second stage involved the selection of a subsample of the schools in the School Survey. This subsample comprised all BIA, Native American, and Alaskan schools, together with subsamples of the remaining public and private schools. The subsample of schools was designed to minimize the amount of overlap with the sample of schools selected for the Library and Librarian Surveys (Abramson et al., 1996). The rest of the public schools were stratified by grade level and local education agency (LEA) urbanicity and then sorted within each explicit stratum by 1993-94 SASS school stratum, Census Region, SASS order of selection code, and SASS School Common Core of Data Identification (CCD ID). Private schools were stratified by recoded affiliation (Catholic, other religious, nonsectarian) and grade level, and then sorted by frame (list frame, area frame) and school enrollment within each explicit stratum. Schools were subsampled for the Student Records Survey using probability proportional to size (PPS) sampling. The measure of size used in the subsampling was the school's measure of size for the School Survey multiplied by the school's inverse probability of selection for that survey. The use of this measure of size in effect cancels out the differential sampling rates used for sampling schools in different strata for the School Survey. Any school with a measure of size larger than the sampling interval was selected with certainty for the student sample.

The next stage of sampling selected approximately three teachers from each subsampled school. Within the selected schools, all teachers sampled for the Teacher Survey were eligible for the Student Records Survey, and three of them were randomly selected per school. If three or fewer teachers in a selected school were sampled for the Teacher Survey, then all sampled teachers within the school were selected.

The final stage of sampling was to select two students per selected teacher, for a total of six students per selected school. This selection was done by U.S. Census Bureau staff in Jeffersonville through telephone contact with a representative of the sampled school, when possible, and through a personal visit of a field representative when the selection could not be done by telephone. The first step was to determine teacher eligibility. Sampled teachers who did not teach regularly scheduled classes were considered ineligible and were excluded. Eligible teachers were then classified as either self-contained (teaching the same group of students for most of the day) or departmental. For self-contained teachers, a copy of the class roster was requested. Two students were selected randomly from the roster by U.S. Census Bureau staff. The procedure was more complicated for departmental teachers. For such teachers, a sample class period was selected first for each teacher. To accomplish this, a set of five possible class periods was selected for each school (one from each day of the week). Next, it was determined during which of the selected five class periods the departmental teacher taught a class. From these, one class period was selected randomly. If no class period was found for the departmental teacher from the first five selected, then five more class periods were selected, and the process was repeated. If this still did not prove successful in selecting a class, the school was asked for all class periods that the teacher taught and one was randomly selected. A copy of the class roster for the sample period and day was requested and two students were selected by U.S. Census Bureau staff.

The Student Records Survey selected a total sample of 1,751 schools, allocated across types of schools as shown in table 8-1. The table also shows the resulting numbers of teachers and students in these schools sampled according to the procedures outlined above. The total sample size of 6,933 students consisted of 5,697 public school students and 1,236 private school students. To meet the survey's analytic objectives, all BIA, Native American, and Alaskan schools were sampled, and thus the student sample contained a large sample of students in Native American schools, and oversamples of Alaskan students and students in BIA schools.

Table 8-1.—Numbers of schools, teachers, and students in the Student Records Survey, by sector: Round 3

Type of school	Number of schools	Number of teachers	Number of students
Total	1,751	4,651	6,933
Private	381	903	1,236
Total public	1,370	3,748	5,697
BIA	176	430	602
Native American	444	1,262	2,024
Alaskan	199	549	759
Other public	551	1,507	2,312

SOURCE: Gruber, Rohr, and Fondelier (1996)

Problems encountered during student sampling. In addition to problems of nonresponse from schools refusing to participate in sampling and failing to complete the student records questionnaires, Parmer, Abramson, Cole, Colaciello, and Garrett (1997) outline a number of problems that occurred as a result of the fact that three of the four stages of selection for students relied on information provided by the respondent (school principal or other school staff member who is familiar with the student's school records). Problems included schools having difficulty in following the sampling instructions over the telephone when having to go through a maximum of three different sets of classes for up to three teachers to identify one eligible class per teacher; finding some unrealistic values for student sampling information on some student records questionnaires, suggesting the possible misreporting of information; the erroneous classification of some sampled teachers as out of scope; and the fact that the number of classes that students take was not asked. As a result of these problems, information needed to select the student sample was sometimes missing or inaccurate, and difficulties arose in computing the students' probabilities of selection (King and Kaufman, 1994). For example, the lack of information on the numbers of classes taken by sampled students had to be handled in developing the weights by assuming that all students in a school took the same number of classes.

Parmer et al. (1997) suggest that an automated sampling worksheet with internal edits would eliminate many of these sampling problems. They also recommend that the selection of classes should be made easier in the future and that information should be collected on the number of classes taken by each sampled student. Cole and Schwanz (1998) also recommend for the future

the development of clear guidelines for determining teacher eligibility in order to reduce misclassification errors.

8.4 CONTENT

The Student Records Survey questionnaire covered the following topics:

- The student's demographic background;
- Whether the student had ever dropped out of school or been suspended from school;
- School programs/services that the student currently receives;
- Current disabilities of the student;
- Counseling services that the student is currently receiving;
- Number of days the student was absent during a given time period;
- Whether the student had ever been retained in a grade;
- The student's current grade level;
- Information on the type of science and math courses enrolled in (if in grade 9 or above);
- The number of advanced placement courses the student was enrolled in (if in grade 9 or above); and
- The student's GPA (if in grade 9 or above).

There was only one version of the Student Records Survey questionnaire, which was sent to all sampled schools to complete for their sampled students.

8.5 DATA COLLECTION PROCEDURES

Field test for 1993. In spring 1993, a field test of the Student Records Survey was conducted to determine whether collecting student data from school records was feasible. The field test tested the proposed student records questionnaire, procedures for selecting the student sample, and the method of data collection.

Since it was planned that students would be sampled for the Student Records Survey from the class rosters of sampled teachers and since the students could each be listed on several rosters, they could have multiple routes of selection for the sample. Information on this multiplicity is needed since it affects the students' selection probabilities and hence their basic weights. To obtain some information on this multiplicity, questions were developed to determine the numbers of the class rosters of the sampled teachers on which each sampled student was listed. Prior to the field test, cognitive research was conducted in four schools to test one method of obtaining this information. Based on the results of that research, the questions were revised and a new set

of questions was tested in two more schools. The set of questions was revised again to produce the set used in the field test.

The Student Records Survey field test tested two alternative methods of data collection—a mailout of the student records questionnaire with telephone followup and a personal visit to select the student sample and collect the student records data. In the first method, schools were mailed a Teacher Listing Record on which they were asked to list their teachers. Three teachers were selected from each school's list. Schools were recontacted to ask for a class roster for a specified class period for each selected teacher, with a request that the rosters be sent to the U.S. Census Bureau by mail or fax. Three students were then selected from each roster, for a total of nine students from each school. Although a few schools did provide rosters by fax, the majority had not returned the rosters by the time the student sample had to be selected. Most of the student sampling was therefore done over the telephone by clerks at a U.S. Census Bureau processing center. Some schools (34 public and 44 private) refused to provide students' names over the telephone and used initials or code numbers instead. Mailout of student records questionnaires, with the school's name and nine students' names on the front of the student records questionnaire, occurred in April 1993. If a completed student records questionnaire was not received from a school, telephone followup was conducted. Table 8-2 shows the numbers of public and private schools selected, the numbers of schools that provided a Teacher Listing Record, the numbers of schools that provided a class roster, and the numbers of completed student records questionnaires for the mail component (i.e., mailout of the student records questionnaires) of the field test. Only 76 percent of the public schools and 69 percent of the private schools in the mail component of the field test returned the Teacher Listing Records. Further losses occurred at the stages of providing class rosters and student records questionnaires, so that overall only 65 percent of public schools and 53 percent of private schools provided the survey data.

Table 8-2.—Numbers of schools participating in the mail component of the Student Records Survey field test, by sector and survey stage: Round 3

Category	Public schools	Private schools
Selected	282	194
Returned Teacher Listing Record	213 (76%)	133 (69%)
Provided rosters	204 (72%)	131 (68%)
Completed student records questionnaires	184 (65%)	103 (53%)

SOURCE: Gruber et al. (1996).

Problems occurred when schools would provide only student initials or code numbers. When the student records questionnaires arrived at the schools, there were only nine sets of numbers or initials on the cover with no indication of the teacher or class involved. In some cases, schools were able to resolve the problem by obtaining information on the teachers and class periods for the sampled students from the U.S. Census Bureau. However, it did not prove possible to handle

these cases when the school did not return the mail student records questionnaire and followup by field representatives was required.

The personal visit method of data collection in the field test was conducted in April 1993 and included 23 public schools and 5 private schools, most of which were BIA or Indian schools. All 5 private schools and 18 of the public schools agreed to participate. The student sample was selected and the student records questionnaires were completed during a personal visit by a U.S. Census Bureau field representative. Since the Department of Education and BIA had requested the inclusion of some supplemental questions in the Student Records Survey for American Indian and Alaska Native students, the student records questionnaire used in this part of the field test included a one-page Indian supplement to test the feasibility of collecting these data.

The field test results led to the Student Records Survey questionnaire being totally redesigned for the 1993-94 survey. The 32-page student records questionnaire with the nine students' names on the cover used in the field test was replaced by a separate four-page student records questionnaire for each student. The student records questionnaires were stapled together inside a cover folder that was preprinted with the school's control number, name, address, and the number of students selected from the school. To maintain better control of the sample, each sample student was assigned his/her own control number whereas, in the field test, only the school had a control number; also included on the cover information for each four-page student records questionnaire was the student's name, teacher's name, selected class period and the names of the three teachers selected for the Student Records Survey.

Procedures. In December 1993, an advance letter was mailed to each of the 1,751 schools selected for the Student Records Survey to describe the purpose of the survey and to explain that the student information was to be collected from administrative records—not from the students themselves. The letter also notified the school that a U.S. Census Bureau representative would contact the school by telephone in January or early February to select a student sample.

Teacher lists had previously (in September 1993) been requested from all schools sampled for Round 3 of the School Survey. Teachers were sampled for the Teacher Survey from these lists as described in section 5.4.2. Within each school sampled for the Student Records Survey, a subsample of three of the teachers sampled for the Teacher Survey was selected for the Student Records Survey. If a school had three or less sample teachers, all sample teachers from the school were selected.

After the sample of three teachers had been selected, the next stage in the operation was for U.S. Census Bureau staff to call the schools to select a class period for each teacher, to ask the school to obtain student rosters for those classes, and to select two students from each class. When schools would not allow sample selection by telephone (288 schools), a personal visit to the school was arranged to select the student sample and to complete the student records questionnaires. These personal interviews occurred between March 21 and June 3, 1994, and data from student records were collected for 811 of the 872 students selected in this way.

Packages of student records questionnaires were mailed in March 1994 to the sampled schools for which student selections had been made. A second mailing of 68 percent of the student

records questionnaires took place in April to schools that had not responded by that time. After that, any school not returning its student records questionnaires was called by a field representative from one of the 12 U.S. Census Bureau regional offices, who completed paper copies of the student records questionnaires by telephone. Telephone followup occurred for 2,704 student records questionnaires (32 percent), of which 1,650 (61 percent) were completed.

8.6 DATA PROCESSING

In data processing, separate records were created for each sampled student. Of the 121 variables (items that required a response) that were computer edited, 20 had change rates greater than 10 percent (where the change rate is the number of item changes divided by the number of completed student records questionnaires). These 20 items included 14 of a set of 15 items that were included to check that the selected student was taught by the selected teacher and during the class period that had been selected. Five of the other six problematic questions related to students in grades 9 or above. They were about the number of advanced placement courses completed or currently enrolled in, the student's current GPA and the grade scale used to compute it, and the number of transcripts sent to colleges or universities for the student.

8.7 MEASUREMENT ERROR

A reinterview program was conducted to assess the reliability of response for a selection of items included in the Student Records Survey. The student records reinterview questionnaire asked about whether the student was taught by the selected teacher, the student's race/ethnicity, grade level, services the student receives, and the student's enrollment in a mathematics class. All the questionnaire data were collected by mail. A sample of two students was selected from each school that responded to the Student Records Survey from amongst the students selected for that survey. This sample was selected on a flow basis as the original questionnaires were returned. Of the students selected in this manner, data were obtained for 1,243. Results of the reinterview were used to validate the information required for deriving basic student weights.

8.8 NONRESPONSE

Unit nonresponse. Unit nonresponse in the Student Records Survey could occur because the sampled school did not participate in the student sampling (by providing a teacher list and class rosters for sampled teachers) or because the school failed to return the completed student records questionnaires for sampled students. The response rates for participating in the student sampling were 88 percent for public schools, 79 percent for private schools, and 94 percent for Indian schools. In schools participating in the student sampling, the student records response rates were 90 percent in public schools, 88 percent in private schools, and 94 percent in Indian schools. Thus the overall weighted unit response rates for the Student Records Survey were 80 percent in public schools, 70 percent in private schools, and 88 percent in Indian schools.

As was done for other Round 3 SASS surveys, Monaco, Salvucci, Zhang, Hu, and Gruber (1998) conducted analyses to examine variation in response rates in the Student Records Survey by school characteristics. The analyses relate to the conditional student response rates in schools participating in the student sampling. Table 8-3 summarizes the results for both public and private school students. For students in public schools, the only characteristic for which the

Table 8-3.—Weighted response rates for the Student Record Survey, by selected school characteristics: Round 3

Characteristics	Weighted response rate (percent)*	
	Public	Private
Region:		
West	83	93
South	93	82
Northeast	91	88
Midwest	97	93
	P=0.003	P=0.128
Urbanicity:		
Central city	95	92
Urban fringe/large town	88	83
Rural	92	92
	P=0.077	P=0.142
School level:		
Combined	95	82
Secondary	90	89
Elementary	92	91
	P=0.581	P=0.131
School size:		
1-149	98	84
150-499	92	91
500-749	94	78
750+	89	95
	P=0.272	P=0.137
School type:		
Nonregular	96	‡
Regular	91	‡
	P=0.402	
Minority enrollment:		
<5.5%	93	‡
5.5-20.5%	89	‡
20.5-50.5%	92	‡
>50.5%	91	‡
	P=0.612	
School sampled with certainty:		
Yes	96	‡
No	91	‡
	P=0.192	
School sampled in 1990-91:		
Yes	90	96
No	92	86
	P=0.650	P=0.025
Typology:		
Catholic	‡	93
Other religious	‡	85
Nonsectarian	‡	79
		P=0.041

*The basic weight is used to reflect the probability of selection.

‡Not applicable.

SOURCE: Monaco et al. (1998)

conditional response rates differed significantly by level (at the 5 percent significance level) was region; the response rate was highest in the Midwest and lowest in the West. For private school students, only two variables, whether or not the school was sampled in 1990-91 and typology, had significantly different conditional response rates by level. Students in private schools also sampled in Round 2 had much higher response rates than students in private schools not sampled in the previous round, but this finding may be explained by the overlap sampling procedures used, with overlap minimized for association groups with low response rates in the previous round. Students in Catholic schools had an appreciably higher response rate than students in other religious schools, who in turn had a higher response rate than students in nonsectarian schools.

A second part of the Monaco et al. (1998) study examined the association of response status for the various SASS components. For public schools, response to the Student Records Survey was associated only with the LEA response to the Teacher Demand and Shortage Survey. For private schools, response to the Student Records Survey was associated only with response to the School Survey.

Item nonresponse. Item response rates in the Student Records Survey were generally high, with only a few instances of rates less than 95 percent for any of the three sectors (public, private, and Indian schools). Only three items had a consistently sizable level of nonresponse: an item asking whether the student had been suspended or expelled from this school due to alcohol or drug abuse had the highest level of nonresponse (around 10 percent); a "mark all that apply" item asking about the grades in which the student had been retained, asked only for students who ever had been retained (around 8 percent for public and private school students, 20 percent for Indian school students); and an item asking about days absent during the last completed grading period (around 7 percent).

8.9 ESTIMATION

Imputation. Missing values were imputed by one of three methods for all but the first three student records questionnaire questions, which were asked to verify sampling information. The first method used other available information from the same record or by making assumptions about the intended answer. The second method used was the hot deck method. Finally, a selected group of questions—gender, grade in which student was retained, mathematics courses, and science courses—were always imputed clerically. In a very few cases, some other entries also were clerically imputed. Imputation flags were used to denote the stage of imputation as for all other SASS surveys.

Imputations were also carried out as a last resort when student sampling information was missing from student data records (Parmer et al., 1997). The item requesting the number of times the student was taught by teacher each week was the least imputed, at a rate of about 2 percent. The highest overall imputation rate, at almost 6 percent, was recorded for the item requesting the class size for the selected class period. (Cole and Schwanz, 1998)

Weighting. The final weight for students from public and private schools consists of the product of the following factors:

- *Basic weight*: the inverse of student's probability of selection conditioned on the specific set of sample teachers selected for the student sample at the school;
- *School nonresponse adjustment factor*: an adjustment to account for schools that did not have students selected because the school did not respond to either the teacher or student sampling procedures;
- *Misclassified teacher adjustment factor*: an adjustment to account for sampled teachers reported to not be teaching regularly scheduled classes during student sampling, but later reported to be teaching in the Teacher Survey;
- *First-stage ratio adjustment factor*: an adjustment to make the sample estimates conform to known frame totals of the number of students;
- *Student noninterview adjustment factor*: an adjustment to account for sampled students whose schools did not return questionnaires or returned incomplete questionnaires, and
- *Student adjustment factor*: a factor to adjust for the inconsistency between the estimated number of students from the SASS school data files and the SASS student sample files.

Different adjustment cells were used for public, private, and BIA school students.

Student weighting problems. As described earlier, students were sampled within schools by first sampling teachers, then if necessary sampling a class period for a sampled teacher, and finally sampling two students from the roster for the sampled class. With this procedure, there are problems in determining a student's probability of selection and hence the basic weight. A student's selection probability depends on the number of different classes he or she took, on the sizes of those classes, and on the selection probabilities for the associated class periods. Lacking full information on these factors, approximations had to be used for the selection probabilities and for the basic weights.

A problem was discovered for American Indian students in public schools, where the estimated coefficient of variation of the estimated total number of students was extremely high, above 50 percent. This large coefficient of variation occurred despite the oversampling of these students. The oversampling was accomplished by selecting BIA schools and schools with large percents of American Indian students with certainty or with high probability. However, a sizable proportion of American Indian students attend other public schools and hence were not oversampled. American Indian students selected from these other schools therefore received very high weights relative to those sampled from the oversampled schools, and these high weights led to the low precision of the estimates for American Indian students. Parmer et al. (1997) investigated 10 alternative weighting schemes for addressing this problem. The scheme finally chosen for the American Indian student sample involved truncating the weights, expanding the acceptable range for the student adjustment factor, and changing the order of collapsing adjustment cells for the student adjustment factor.

Variance estimation. In Round 3, a bootstrap method of variance estimation was employed for all SASS surveys except the Student Records Survey. For the Student Records Survey, the balanced half-sample replication procedure was used because of the small size of the student records sample. For sample students in schools not selected with certainty for this survey, variance strata were formed by pairing the schools. For sample students in schools selected with certainty, sample teachers were used to define the variance strata. A total of 48 replicates was used (Abramson et al., 1996).

9. QUALITY OF SASS

9.1 INTRODUCTION

The earlier chapters in this report have discussed the quality of the data produced by the various surveys that have constituted the Schools and Staffing Survey (SASS) in the first three rounds. The focus of these chapters has been on potential sources of error—in particular, noncoverage, unit and item nonresponse, measurement error, and sampling error—and their possible impact on the accuracy of the survey estimates. This chapter has two objectives. First, it broadens the concept of quality to include issues of relevance, accessibility, and timeliness (section 9.2). Second, it attempts to synthesize the findings from earlier chapters to identify key areas where efforts for methodological improvements might be most effectively directed and where further information is needed for the assessment of survey quality (section 9.3). The chapter ends with some concluding remarks in section 9.4.

9.2 RELEVANCE, ACCESSIBILITY, AND TIMELINESS

The ultimate goal of conducting SASS is to provide the data required by policymakers and researchers to understand the characteristics of the U.S. elementary and secondary education system. Thus, the goal of SASS is to collect the relevant data, to make the results and the data files readily accessible, and to provide data that are as up to date as possible. This section describes the procedures adopted in SASS on the quality dimensions of relevance, accessibility, and timeliness.

Relevance. SASS attempts to ensure that it collects the data needed to inform policy decisions and stimulate research by maintaining close contacts with the broad user community. Before each administration of the survey, the National Center for Education Statistics (NCES) enlisted the help of many experts and specialists in the educational and policy communities to examine SASS and propose changes to the survey's content and methods. In addition, the Advisory Council on Education Statistics (ACES)—the advisory panel for NCES—reviewed the plans for SASS at each round, and the SASS Technical Review Panel met regularly to discuss the recommendations made by other groups and to provide a broad evaluation of the plans for the content, design, analysis, and reporting of the survey.

As discussed in section 1.2, NCES introduced SASS in 1987 in the context of the national school reform movement of that period. There was an acute need for data on the teacher labor market, sources of new teachers, and the conditions under which teachers would choose to enter, remain, or leave teaching. Teacher quality and school characteristics were issues of concern. With the help of experts and specialists in the educational research and policy community, the content of the initial round of SASS, therefore, was developed to measure critical aspects of teacher supply and demand, to profile the qualifications and working conditions of teachers and administrators, and to describe basic conditions in schools as workplaces and learning environments (see Hudson and Darling-Hammond, 1987).

In planning for Round 2, attention focused on the need for significant changes in a number of the operational and design elements, as well as on improving the wording and design of specific

questions, but the overall content of Round 1 was seen as continuing to meet the data needs. The wording of selected questions and the design of questionnaires underwent considerable modification between Rounds 1 and 2, but the basic subject content remained essentially unchanged.

Again, the planning for Round 3 focused primarily on further changes in design and procedures, such as modifying questionnaires to simplify the work of respondents, deleting some questions that yielded little usable information, and reformatting others. However, some additions and modifications to content were included in Round 3. For example, a student record questionnaire, designed to obtain student data from school records, became a new component of SASS and, in Round 3, the data collection was expanded to include a component on libraries and librarians.

The 6-year period between Rounds 3 and 4 provided the opportunity for a major review of the content and purposes of SASS, in light of the many changes in education policy and thinking since the inception of the survey in 1987. The redesign of SASS engaged many segments of the education research and policy community. In 1995, NCES commissioned experts from academia, the research community, and specialists in technology, teacher education, and state and local data collection to examine SASS and propose changes in content and methodology (Mullens and Kasprzyk, 1997). This was followed by expert panels composed of researchers, policy analysts, and others involved in school reform, who provided comments and recommendations for the new round of data collection. Separate panels explored how SASS could contribute to a better understanding of teacher supply and demand and school reform. They reviewed the previous SASS content on these topics and identified common themes or issues that suggested the need for revisions. The SASS Technical Review Panel met regularly to discuss the recommendations proposed by other groups, and it provided a broad evaluation of the plans for the context, design, analysis, and reporting of SASS data. NCES's advisory panel, ACES, also reviewed these and similar issues in preparation for a refocused SASS in 1999-00.

Round 4 of SASS that emerged from these diverse efforts shifts emphasis from teacher supply and demand issues to the measurement of teacher and school capacity, both objectives of the recent school reform agenda. These changes reflect shifts in the policy debate from teacher quantity—the numbers of vacant teaching positions—to teacher quality—the qualifications of teachers who were hired and retained. To measure teacher capacity, the redesigned SASS examines teacher qualifications, teacher career paths (including induction experience), and professional development. To measure school capacity, SASS concentrates on school organization and decisionmaking, curriculum and instruction, parental involvement, school safety and discipline, and school resources.

Accessibility. The value of a survey depends on the extent to which its data are used, which in turn depends on the accessibility of the survey results and the survey data files. Moreover, the proper use of the survey data requires the availability of good documentation.

Results from SASS are published in descriptive reports, analytic reports, and issue briefs. The descriptive reports, consisting of statistical profiles, education tabulations (ED tabs), and survey reports, present basic information about schools, principals, and teachers; for example, the length of teaching experience of principals, student participation in public school programs, such as free

or reduced price lunches, and the qualifications and years of experience of public and private school teachers (e.g., Fiore and Curtin, 1997; Bobbitt, Broughman, and Gruber, 1995; Henke, Choy, Geis, and Broughman, 1996). Analytic reports examine issues of particular interest in more detail, for instance, teacher attrition, teacher and principal qualifications, professional development, out of field teaching, and sources of supply for new teachers (e.g., Ingersoll, Han, and Bobbitt, 1995; Ingersoll and Gruber, 1996). The issue briefs provide short accounts of about two pages in length on topics of current concern, and present limited data. A complete list of SASS publications, with instructions for how to view, order, or download them, is available on the World Wide Web at **http://nces.ed.gov/surveys/sass**.

NCES recently conducted a study to explore the satisfaction of key customers with SASS publications by means of individual interviews with 30 selected representatives from state education agencies and 19 other key customers (Rouk, Weiner, and Riley, 1999). In general, these customers considered the publications to be easily accessible, the content appropriate for their data needs, and the presentations quite clear. In addition, focus group discussions were held with individuals from Federal and state government, research, and data management organizations to obtain reactions concerning the appropriateness, usability, and accessibility of two key SASS publications: *A Statistical Profile, 1993-94* (Henke et al, 1996) and *SASS by State, 1993-94* (De Mello and Broughman, 1996). In general, the comments of the participants on the format and content of SASS tabulations were favorable; they also provided suggestions for additional tabulation detail.

In addition to the publication of results from SASS, NCES makes microdata available for different or more detailed analyses by users. The public-use data files provided to the public are a subset of the full data set. Some variables are suppressed, the level of detail for others is reduced because of the need to protect the confidentiality of the respondents. Specifically, NCES removes all state identifiers and stratum codes in the public-use files to prevent disclosing the identities of schools, individual administrators, and teachers. On the administrator and teacher files, income and age are coded into class intervals, and other personal information, such as the college or university attended, is converted into an appropriate recode. Detailed affiliation codes for private schools are collapsed into three broad categories: Catholic, other religious, and nonsectarian schools. School district data in the public-use file cannot be merged with other components of the survey.

The SASS public-use microdata for Rounds 1 to 3 are available on CD-ROM (NCES 98-312), which can be obtained by calling Ed Pubs at 1-877-4-EDPUBS, faxing a request to 1-301-470-1244, or using the Internet address **http://www.ed.gov/pubs/edpubs.html**. The CD-ROM also includes the data file user's manuals for each round. These manuals provide information on the design and procedures for the surveys and include the database documentation and copies of the questionnaires.

Users who need the full data sets for detailed analyses can apply for a license to access the SASS restricted-use data. The unabridged data are not subject to the disclosure avoidance procedures and, hence, provide a richer database to support detailed analyses. Requests for licensing should be sent to the NCES Data Security Office, Statistical Standards Program, NCES/OERI, U.S. Department of Education, 1990 K Street, NW, Washington DC 20006. The Data Security Office

will provide an *NCES Restricted-Use Data Manual* that describes the procedure to apply for a license.

Another important facet of accessibility is documentation. Clear, concise, complete documentation is an essential component of understanding and using SASS data. To assist users, whatever their objectives, NCES provides a wide variety of documentation in a number of forms. As noted throughout the Profile, a *Data File User's Manual* is available for each round, both in printed form and on CD-ROM, to provide a comprehensive source of information about each of the surveys that constitute SASS. In similar fashion, a *Sample Design and Estimation Report* provides a detailed description of the sample design and estimation procedures, including variance computation, for each of the surveys in each round. Additional information about SASS procedures and data quality is contained in the many SASS methodological publications; they may be found on the SASS Home Page (**http://nces.ed.gov/surveys/sass**), as are SASS data and questionnaires.

The current SASS documentation is primarily cross-sectional in nature, providing factual information for each individual round of the survey. This form of documentation is well suited to the needs of those who analyze a single round of SASS. Each User's Manual contains a brief discussion of changes from the previous round; however it may not fully satisfy the needs of those who use 2 or more rounds of SASS data to examine change over time, and of methodologists and others who want to understand and assess the evolution of the SASS methodology. Analysts of 2 or more rounds of the survey need documentation that clearly draws their attention to the definitional and operational changes between rounds that may affect their analyses. Methodologists need documentation that provides the rationale for the changes made and an assessment of the effectiveness of the changes. As data from more rounds of SASS become available, interest in more complete documentation that provides a linkage across rounds will increase.

Timeliness and periodicity. Since the inception of SASS in 1987, significant effort has been devoted toward producing the results in a timely fashion. Experience to date indicates that steady strides have been made to improve timeliness (see table 9-1). In Round 1, for example, information for principals, schools, and teachers was available in about 2 years after the completion of data collection; school district information became available in about 3 years. Each succeeding round has improved on this timing—data from Round 2 were first published in January 1993, about 1 1/2 years after the end of data collection, and Round 3 publication began in June 1995, only about 12 months after the end of data collection. Plans for Round 4 call for the data to become available even sooner, in spring 2001, only some 8 months following completion of data collection. Factors that have contributed to this positive trend of providing the data in a shorter time period include: the growing familiarity with the subject matter, which leads to standardization and greater efficiency in processing; the repetition of data collection that permits investment in technology (such as the use of computer-assisted telephone interviewing, advanced data entry, and increased use of computer editing); and improvements in the collection procedures and instruments that result in more complete returns and a shorter time period required to collect the information. Improvements in data processing also have contributed significantly; specifically, capturing data through imaging rather than data keying and using generalized software systems throughout the process have led to accelerated processing.

Table 9-1.—Timing of core SASS surveys, by round and activity

Round and survey	Start of data collection	End of data collection	Data file released	First publication issued	Type of publication
Round 1 (1987-88)					
School district	1/88	6/88	4/91	8/91	ED tabs
Principal	1/88	6/88	4/91	5/90	ED tabs
School	2/88	6/88	4/91	7/90	ED tabs
Teacher	4/88	6/88	4/91	7/90	ED tabs
Round 2 (1990-91)					
School district	12/90	6/91	1/93	3/93	Issue brief
Principal	12/90	6/91	1/93	6/93	Issue brief
School	12/90	6/91	1/93	6/93	ED tabs
Teacher	2/91	6/91	1/93	6/93	Issue brief
Round 3 (1993-94)					
School district	10/1/93	6/94	6/95	7/95	ED tabs
Principal	10/4/93	4/94	6/95	7/95	ED tabs
School	11/30/93	5/94	6/95	7/95	ED tabs
Teacher	11/30/93	6/94	6/95	7/95	ED tabs

On the issue of periodicity, SASS was designed to provide an ongoing and consistent source of data on the teaching workforce and school population. Rounds 1 to 3 of SASS were conducted at 3-year intervals in 1987-88, 1990-91, and 1993-94. The interval between Rounds 3 and 4, administered in 1999-00, was extended to 6 years, in part because of budget limitations, thus providing an opportunity to reconsider the content and purposes of SASS.

Some thought has been given to the possibility of a different cycle for SASS. An initial exploration of the implications of cycles of varying length was undertaken to provide guidance on when the second round of SASS should be conducted. Models were developed to explore the tradeoffs between the cost of a survey cycle and the errors of key estimates, with the cost depending on periodicity and sample sizes and the error being expressed as a composite of sampling error and the error of prediction based on prior year estimates. Several other factors, including response burden and the need for time to evaluate the Round 1 content and methodology, influenced the decision in favor of a 3-year interval between Rounds 1 and 2. This modeling approach is discussed by Ghosh, Kaufman, Smith and Chang (1994), Smith, Ghosh, and Chang (1995), and by Smith, Ghosh and Chang (1997) who attempted various optimization calculations based on estimates of key variables from the first three rounds.

The next SASS is currently planned for 2003-04 and is to be conducted on a 4-year cycle thereafter, as suggested by a survey of users and discussion by the SASS Technical Review

Panel and the NCES Advisory Council on Education Statistics (ACES). The following reasons support this conclusion:

- As a unique source of national and state representative data on important topics in education reform, SASS users considered that a 5-year cycle was too long a gap for the survey to maintain its currency and provide timely data to support policy planning.

- A 4-year cycle beginning with 1999-00 and the next administration in 2003-04 would allow SASS to coincide with the cycle of presidential elections and with the reauthorization schedule for the major elementary and secondary education legislation. This schedule would allow data from SASS to become available around the start of each presidency when the government and policymakers need data to inform the planning of new initiatives.

- A 4-year cycle for SASS would also allow the possibility of administering the SASS and the National Assessment of Educational Progress (NAEP) student assessment at the same time in some of the same schools (Skaggs and Kaufman, 2000). A SASS-NAEP linkage is being conducted as a research and development project in 1999-00 to enrich the database for research. If the linkage is successful and the results prove useful, a similar linkage may be sought in future rounds of SASS. The 2-year cycle for NAEP and a 4-year cycle for SASS would allow the possibility for the two surveys to be synchronized again in 2003-04.

9.3 DATA QUALITY

Based on the detailed findings presented in earlier chapters, this section reviews the main sources of potential error for SASS with the aim of identifying areas where methodological improvements are most needed and areas where further methodological studies would shed more light on data quality issues. The four sources of error discussed below are sampling error, coverage error, nonresponse, and measurement error.

Sampling error. Each of the individual surveys in SASS is designed to produce certain key estimates with specified levels of precision. Sample sizes are chosen to satisfy these precision requirements. Given this situation, a key issue with regard to sampling error is the efficiency of the sample design.

The assessment of sampling efficiency is complex because of the interrelationships of the several survey components and the requirements for estimates of specified precision for many different domains. These features inevitably lead to compromises in the sample designs for the individual surveys. In particular, since the sample of schools selected for the School Survey is the starting point for the samples for all the other surveys, its design places constraints on the sample designs for the other surveys.

The sample design for the School Survey is a compromise design that takes account of the needs of both that survey and the Teacher Survey. Schools are sampled with probability proportional to a measure of size that is the square root of the number of teachers, as a compromise between the equal probability that would be appropriate for the School Survey and probability proportional to the number of teachers that would be appropriate for the Teacher Survey (see section 2.3). The use of this compromise measure of size also has implications for the other

SASS components: sampling schools with equal probability would be more appropriate for the Principal Survey, the Library Survey and the Librarian Survey, whereas sampling with probability proportional to the number of teachers (which may be roughly proportional to the number of students) may be more suitable for the Student Records Survey. In the Teacher Demand and Shortage Survey, with a local education agency (LEA) being sampled if any school in its district is sampled, the appropriate measure of size for sampling public schools is difficult to determine; however, for private schools, sampling with equal probability would be appropriate.

An issue that is related to the choice of a measure of size for sampling schools is the form of the estimates to be produced. An equal probability sample of schools is appropriate for the School, Principal, Library, and Librarian Surveys if the estimates produced are expressed in terms of numbers or percents of schools, principals, libraries, or librarians, with given characteristics, for example the percent of principals who consider student use of alcohol a problem in their schools. If the problem of alcohol occurs mainly in large schools, the percent of principals considering student use of alcohol a problem will be very different from the percent of students in schools where the principal considers it a problem, and often the latter percent is the relevant one. In discussing this issue, Kish (1965, p. 418) gives the example that, around 1957, one-half of American high schools offered no physics, but that these schools accounted for only 2 percent of high school students. For most purposes, the 2 percent figure is the more meaningful one. The form of estimate to be used is important for choice of sample design since an efficient design for student-based estimates would sample schools with probability proportional to the number of students, as distinct from the equal probability sampling that is appropriate for school-, principal-, library-, or librarian-based estimates.

Another example of compromise in sample design relates to the sample allocation used in the School Survey to provide domain estimates of specified precision. The smaller Library, Librarian, and Student Records Surveys are not designed to provide all these domain estimates, and therefore they subsample in a manner that attempts to redress the unequal allocation of the sample across domains. However, this subsampling cannot fully compensate for the domain oversampling.

No extensive evaluation of the interrelated sample design for the surveys in SASS has been conducted. There are two advantages of the interrelated design: first, data from the different surveys can be linked for analysis (for example, data from the principal and teachers in the same school can be analyzed together); and, second, there are some cost savings in sample selection. However, the interrelated design places a high response burden on sampled schools, which may harm response rates, and it involves the compromises discussed above. Since SASS is itself evolving and since circumstances are changing, a broad ranging review of the interrelated design would be advisable periodically. Such a review could determine whether all the survey components should remain interrelated as at present, or whether some of the surveys should be conducted separately from the core surveys.

Assuming that the interrelated design is retained, research could usefully be conducted based on data collected in the first 4 rounds to determine whether any improvements in sampling efficiency can be obtained. For example, early research led to the decision to sample schools

first and then select the LEAs of sampled schools (see section 2.3). This decision could be reviewed using the data now available. Also, schools are sampled with probabilities proportional to the square roots of their numbers of teachers. The suitability of that measure of size could be assessed. A full review of the SASS interrelated sample design would be a complex undertaking since many design choices affect different survey components in different ways, but even some limited evaluations may lead to useful gains in sample efficiency.

Coverage error. The ideal sampling frame for a survey would include every element in the survey's target population with a single listing for each element. In practice, this ideal is rarely achieved, and there is clear evidence that it is not achieved in the component surveys of SASS.

The issue of school coverage is particularly important in SASS because of the nested structure of the surveys. In recent rounds, the Common Core of Data (CCD), supplemented by lists of schools from the Bureau of Indian Affairs (BIA) and the Department of Defense (DOD), has served as the sampling frame for public schools, and the Private School Survey (PSS), supplemented by updated lists of affiliation members, has been used for private schools. In Round 4, an additional frame has been included for charter schools.

Both the CCD and PSS have imperfections as described in section 2.4.3. Since they are used for several NCES surveys, their coverage is the subject of broad interest. Several recent studies have evaluated their coverage, and continuous efforts will be made to improve them. An issue of concern to SASS is that inevitably the frames are out of date for the school year of the survey. As a result, new schools and recent school splits and mergers are not reflected on the frames (the area frame component of the private school sample partially addresses this issue). It would be useful to determine the magnitude of the coverage problem from this source, and also, to evaluate the quality of the list of charter schools.

A significant problem with coverage is that a survey's definition of the units to be covered may not conform to the structure and terminology used in different parts of the population. Thus, for example, some states consider certain administrative groups of schools to be single schools, whereas SASS defines each individual administrative unit to be a school. This kind of problem affects both the frame listings and the data reported for a sampled "school." The definitional problem arises particularly with students and teachers, since the sampled schools provide the listings of these individuals. It is a particularly severe problem in the teacher listing operation, since defining who is to be included as a teacher is not straightforward. In this situation, there is the risk that the person completing the form will use the school terminology for a teacher rather than the SASS definition.

A particular concern with coverage in the Teacher Survey relates to the operational procedures that define the sample. Teachers who are sampled from the teacher listing forms but have left the school by the time of the Teacher Survey data collection are treated as out of scope, while teachers joining the school in the interim have no chance of selection. Thus, the survey's coverage is neither teachers at the beginning of the school year nor teachers at the time of data collection. No study of teacher mobility within a school year has been conducted to date to assess the magnitude of the problem.

Additional noncoverage problems may also occur in the School Principal Survey, the Library Survey, and the Librarian Survey, where some schools classify themselves as out of scope (having no principal, library, or librarian). A study to determine the extent of such classification errors would be useful.

Nonresponse. The response rates to the various SASS surveys have generally been high for public schools. For example, in Round 3, the public school response rates for all the surveys that were conducted in a single phase of data collection were over 90 percent. The Teacher Survey and the Student Records Survey had lower response rates at just over 80 percent as a result of the two opportunities for nonresponse. In the Teacher Survey, nonresponse could have occurred because the school did not provide the teacher list for sampling teachers or because a sampled teacher failed to respond. In the Student Records Survey, nonresponse could have occurred because a school did not provide a teacher list and class rosters for sampled teachers or because the school failed to return the completed questionnaires for sampled students. The lowest public school response rate has been that for the Teacher Followup Survey. Although a high proportion of teachers responding to the Teacher Survey respond also to the Teacher Followup Survey, the additional phase of data collection leads to some further losses that resulted in an overall response rate of 77 percent for Round 3.

For private schools, the response rates for all the surveys in SASS have been markedly lower than those for public schools. In Round 3, only the School Survey and the Principal Survey had response rates of over 80 percent. The response rates for the other surveys were 70 percent or somewhat higher, except for the Teacher Followup Survey where the overall response rate was only 64 percent.

As with any repeated survey, continuing attention needs to be given in SASS to maintaining and, if possible, increasing response rates. Experimental studies could usefully be conducted to test out methods to improve response rates, particularly for the private school components of the SASS. A range of possible methods could be considered, including the use of different sponsors targeted at different types of schools, the use of incentives, and the use of shorter questionnaires that are easier to complete.

To achieve its final response rates, SASS employs a combination of mail questionnaires followed by telephone interviews with mail nonrespondents and field followup, if necessary. The per-unit cost of the telephone data collection is much higher than that for mail data collection. Also, there are indications that mail responses are of higher quality than telephone responses (although this is based on non-experimental data). For both these reasons it is desirable to maximize the mail response rates. The use of the postcard reminder cards and allowing a longer interval for mail returns in Round 3 may have contributed to higher mail response rates in that round. Continued efforts to improve the user-friendly format of the questionnaires and the accompanying material may also help to increase mail response rates.

Item nonresponse rates vary greatly. Many items have high response rates, but there are others with low response rates. Some low response rates are likely to result from the difficulty or, in a few cases, the sensitivity of the information requested. Others appear to be caused by respondents' failure to navigate correctly through a questionnaire's skip instructions. It may be

possible to reduce some of those problems by revising the content and wording of questions and by changing the format and layout of the questionnaires.

Recent research on the design of self-completion questionnaires deals with the principles of design for navigating the respondent through the questionnaire, as well as more generally for obtaining responses of high quality. In addition, advances in printing methods facilitate the use of such tools as color, shading, and different font sizes that increase the available design options in an important way. Attention to ensuring that the SASS questionnaires are as user-friendly as possible addresses not only the item nonresponse problem. It may also reduce total nonresponse, obtain more valid responses, and reduce the number of changes made in editing.

Measurement error. A variety of methods has been used to investigate measurement errors in the SASS, including reinterviews, a record check study, in-depth interviews using cognitive research techniques, methodological experiments, reviews of completed questionnaires, analysis of errors and inconsistencies detected during data processing, and aggregate comparisons of survey estimates with estimates from external sources (which deal with all types of error in combination). A variety of methods is needed since all methods have their limitations.

The reinterview program is a core component of the measurement error research in SASS, being applied in most of the surveys at each round. This program has been valuable in identifying items with high response variance, and many of these items have been revised in later rounds in an attempt to reduce the response variance. However, reinterviews have two main limitations. First, they measure only inconsistency of response, and thus fail to identify cases where a respondent consistently gives a wrong answer (as might occur if the respondent applies his or her own understanding of the meaning of a term such as school or teacher, where that understanding differs from the survey's definition). Second, by themselves, reinterviews fail to indicate the reasons for inconsistency.

In Round 2, the SASS reinterview program tried to overcome the second limitation by a subsequent reconciliation step, using dependent interviewing, but this did not work well. The interviewers conducting the reinterviews used a paper-and-pencil questionnaire on which the original responses were recorded on the right-hand side. It seems likely that the interviewers were influenced by the original responses in recording the reinterview responses, thereby creating the markedly greater consistency observed in the reinterviews in Round 2 than was observed in Rounds 1 and 3. A modification of the reinterview procedure that should address this problem would be to use CATI for the reinterviews, with the original responses then being withheld from the interviewers until the reconciliation part of the interview. Such an approach should yield valid estimates of response consistency. Whether the approach is useful depends on the ability of the reconciliation process to determine the reasons for the observed inconsistencies, with knowledge of those reasons then guiding questionnaire redesign to produce more accurate responses. While such reconciliation studies may be useful in SASS, it should be noted that, in general, reconciliation studies have had limited success in identifying reasons for inconsistencies that could be addressed by questionnaire redesign.

A common finding from the reinterview program across all surveys has been the low level of reliability for opinion questions. This finding is consistent with the results for opinion questions

in other surveys. Such unreliability may be acceptable for some limited forms of analysis, but is problematic for more detailed analysis. For the latter type of analysis it may be necessary to improve the reliability with which a construct is measured by creating an index from the responses to several questions relating to that construct.

Record check studies are often valuable for examining measurement errors, but they also have their limitations. Most importantly, they can be used only when the relevant information is available on records and access can be obtained. Even when this is the case, there remain problems of erroneous matches and failures to match, incorrect information on the records, and differences between the definitions of the variable for the records and for the survey. For these various reasons, the only record check study conducted in SASS to date has been the teacher transcript record check study.

The attraction of a record check study is that it seeks to determine "true values" with which the survey responses can be compared (subject to the limitations indicated above). Another approach for obtaining true values is to conduct in-depth followup interviews, with extensive questioning and encouragement to respondents to consult records, for a subset of key items (e.g., number of full-time equivalent teachers in the school). Not only can this approach give true values (with some error), it can also sometimes identify the sources of error (e.g., counting a part-time teacher as a full-time teacher). This approach may be useful in a future pilot study and/or a future round of SASS.

Comparisons of SASS estimates with estimates from other sources provide an overall evaluation of the SASS estimates. However, the opportunities for such comparisons are very limited, and even when they can be made, they tend to be of limited value. Any differences observed may reflect definitional differences, differences in the time reference, errors in the other sources, or errors in SASS arising from any combination of noncoverage, nonresponse, sampling, measurement or processing. As a result, the aggregate comparisons that have been made in Rounds 1 to 3 of SASS have been useful in drawing attention to some major discrepancies, but have generally not been able to identify the causes of the discrepancies. An extension of the aggregate comparison approach is to perform micro-level matching of SASS responses and similar data in record sources. This type of match may provide an understanding of the discrepancies and, hence, indicate whether changes should be made in SASS. For example, such a match conducted at the school level to compare SASS and CCD data on the numbers of full-time equivalent teachers found that schools often appeared to report headcounts, rather than FTE counts. Application of micro-level matches in other areas could prove equally useful.

9.4 CONCLUDING REMARKS

This report has reviewed a variety of error sources including coverage issues, nonresponse, and measurement and sampling errors and has provided quantitative measures of error where possible. However, in general, the effects that an error source may have on a survey estimate cannot be easily quantified. For instance, the lower the response rate, the greater the likelihood of a significant nonresponse bias, even after nonresponse adjustments have been made, but the magnitude of the bias in a particular estimate is unknown. Furthermore, it has not been feasible to combine all the indications of quality into an overall index of total survey error for a given survey estimate. Nevertheless, the information on quality presented in the report should help

users to decide how much confidence to place in the estimates of interest to them and to determine how best to use the survey data in their analyses.

This report is also intended to help those conducting SASS in directing new survey design efforts to areas of the surveys where improvements will be most productive. This chapter suggests a number of possible research projects that may guide future methodological developments using the current approach. In a broader context, SASS will also need to keep in touch with technological advances in communications. In particular, the rapid advances taking place in the use of the internet suggest that by Round 5 or 6 of SASS the preferred mode of data collection may shift from a mail questionnaire to a web-based questionnaire for several of the surveys. A number of special research studies will be needed to develop the new methods before such a change can be implemented in SASS data collection operations.

Finally, it should be noted that this edition of the Quality Profile is an update of the earlier edition. It is anticipated that the Quality Profile will be updated again in the future to incorporate the information about subsequent rounds of SASS. Documentation on the survey operations for Round 4 and on research projects is being carefully maintained to assist in the preparation of the next edition. Readers are invited to submit suggestions for improvements for the next edition to: SASS Quality Profile, 1990 K Street, N.W., Washington, D.C. 20006.

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